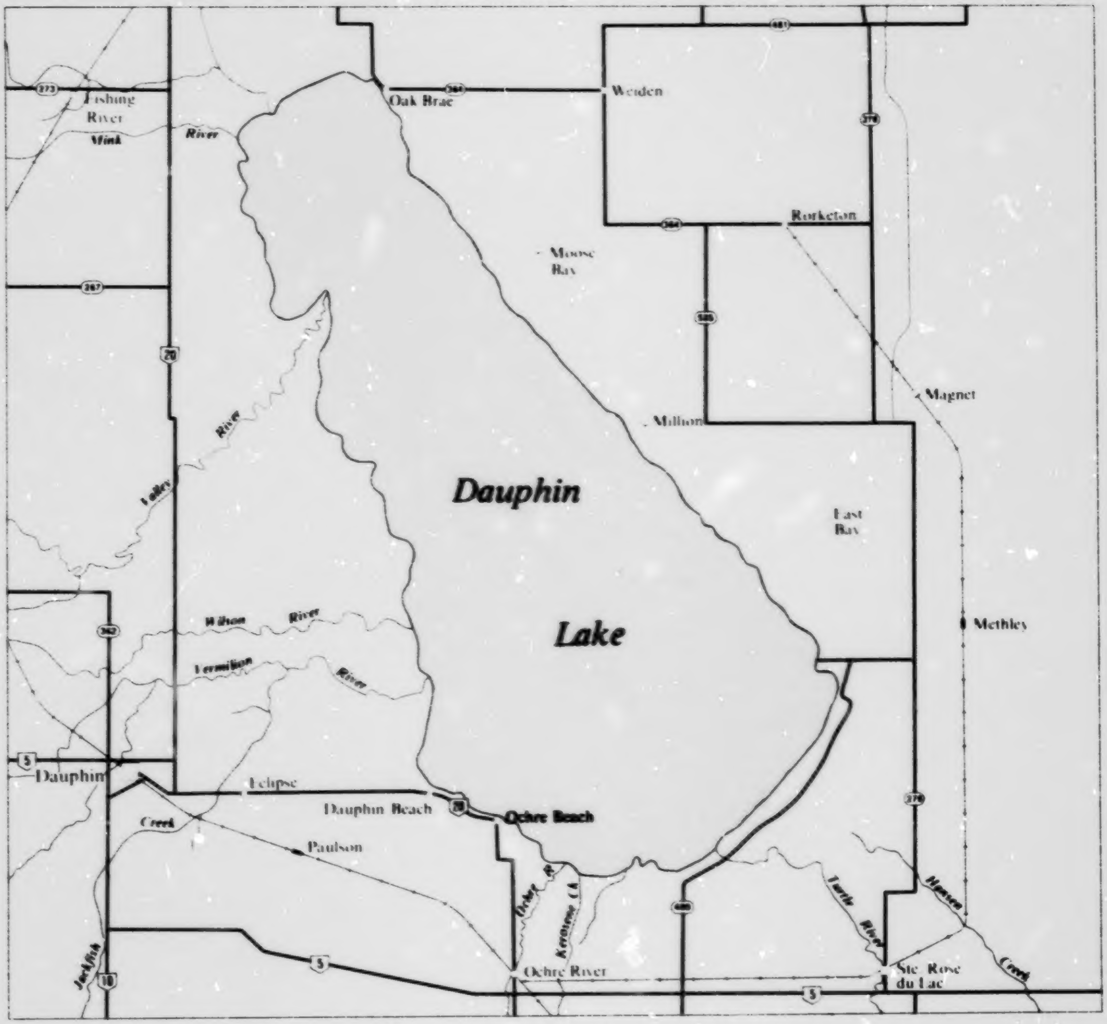
DAUPHIN LAKE

Regulation and Siltation Study


Fishing River
Mink River
Oak Brae
Weiden
Rorketon
Moose Bay
Million
Magnet
Valley River
Dauphin
Lake
East Bay
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Wilson River
Vermilion River
Dauphin
Eclipse
Dauphin Beach
Ochre Beach
Creek
Paulson
Ochre R.
Kerosene Cr.
Turtle River
Hansen Creek
Jackfish
Ochre River
Ste. Rose du Lac

March 1984

Manitoba Water Commission

84- 4642 /

DAUPHIN LAKE

REGULATION AND SILTATION STUDY

Manitoba
Water Commission

Telephone: 944-4482/83

THE MANITOBA WATER COMMISSION
847 — 405 Broadway Avenue
WINNIPEG, MANITOBA
R3C 3L6

The Honourable A.H. Mackling
Minister
Department of Natural Resources
Room 215 Legislative Building
Winnipeg, Manitoba
R3C 0V8

Dear Mr. Mackling:

The Manitoba Water Commission has the pleasure to present the "Dauphin Lake Regulation and Siltation Study".

The Manitoba Water Commission held public hearings in Dauphin on September 1 & 2, 1982. In the preparation of this report the Commission acknowledges technical support received from the Water Resources Branch, Wildlife Branch, Parks Branch, Fisheries Branch, Surveys & Mapping Branch the Department of Agriculture, the Municipalities of Dauphin and Ochre River, and The Freshwater Institute. Dr. Robert W. Newbury of the University of Manitoba was particularly helpful in providing a tour of the escarpment as well as excellent technical advice.

The Commission respectfully submits that the recommendations contained in this report will assist the Government of Manitoba in formulating policies with respect to the management of Dauphin Lake.

Yours respectfully

D. A. Duncan
D.A. Duncan
Chairman

Ball
T. Ball

H. Harapiak
H. Harapiak, M.L.A.

Fallis
K. Fallis

E. Nixon
E. Nixon

SYNOPSIS

Changes to the natural environment in the drainage basins flowing into Dauphin Lake have resulted in alterations to the hydrology that are creating stress on the lake. More rapid runoff has reduced dramatically the time between rain falling or snow melting in the drainage basins and the arrival of the water in the lake. This reduced lag time has resulted in increased erosion and siltation and has produced great variability in the level of the lake.

The Commission contends that the problem is not so much one of higher lake levels, although this is more problematic in some months than others, but rather the inability to handle the increased variability and dramatic precipitation events, such as the 1974 flood.

The level of the lake is a function of the rate of inflow and outflow of water, and any attempt to obtain greater control must be designed to reduce the rate of inflow, or increase rate of outflow, or both. The Commission is of the opinion that any change in the regulated level of the lake should only take place if better controls of the inflow and outflow are established. Control of the inflow is seen as being more important because it also provides for a reduction in erosion, siltation and nutrient loading. However, an increase in the outflow capacity can apparently be achieved and should also be considered.

This report examines the history of the Dauphin Lake problems and various components of a complex physical, economic and social system.

The processes of erosion, siltation and eutrophication are natural, and the recommendations of the Commission are not intended to counteract or reverse them, but rather are an attempt to offset the acceleration of the life cycle of the lake caused by human activities. The overwhelming consensus at the public hearings was that the lake should be saved, even among those groups who opposed an increase in the level of the lake. The Commission notes that the major concern of those who opposed a higher lake level, was the inability to dispose of a sudden increase in the lake level, with the result that their land and livelihood was disrupted. This is a legitimate concern and one which the increased outflow capability addresses. The Commission also recognizes the more important overall concern, namely the health of the lake which is being threatened by shallower water. It is of the opinion that a reduction of silt inflow, and a raising of the lake level, will restore many decades to the life of Dauphin Lake.

DAUPHIN LAKE

REGULATION AND SILTATION STUDY

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I. INTRODUCTION

In the proposed Terms of Reference respecting Dauphin Lake dated August, 1982, the Honourable Alvin H. Mackling, did direct that the Manitoba Water Commission "having regard to the needs of the various interests which are or may be affected by the levels of Dauphin Lake now and in the forseeable future, will determine and recommend to me an acceptable range of regulation for Dauphin Lake. The Commission will also determine and recommend what, if any, measures should be taken with regard to problems related to siltation in Dauphin Lake." The said Terms of Reference are shown in Appendix I, of this report.

The Minister also requested that the Commission hold hearings in Dauphin to review the proposed Terms of Reference and, if deemed necessary, to amend the said terms. It was subsequently determined that the proposed Terms of Reference were adequate.

Pursuant to the said Terms of Reference, the Manitoba Water Commission held public hearings in Dauphin, Manitoba on the first and second day of September, 1982. Selected quotations of these hearings are contained in Appendix II of this report.

It should,perhaps,be noted at this time, that the Manitoba Water Commission had been directed on two previous occasions; (1) by the Honourable Harry J. Enns, Minister of Highways, on the 26th day of July, 1968, and (2) by the Honourable Sidney Green, Minister of Mines and Environmental Management, on September 1, 1972, "to determine and recommend to the Minister what it considers to be the most acceptable and practicable range of regulation within which the levels of Lake Dauphin might be controlled to best meet the needs of the various interests which are, or may be affected by the levels of this lake now and in the foreseeable future."

The recommendations, arising out of the hearings held pursuant to the two previous directives, were that Dauphin Lake should continue to be regulated to an upper target level of 854.3 feet (260.39 m) a.s.l., as established in 1953 on the recommendations of the Lake Dauphin Advisory Board which was set up in 1951, and that further studies be undertaken and, following the results thereof, the regulation levels of Dauphin Lake be reviewed.

Since 1968, numerous studies have been undertaken regarding the regulation of Dauphin Lake and other factors relative thereto. Some of the studies conducted were of a technical nature and provided valuable information, while others acknowledged that the data they sought was limited, hence their findings were inconclusive, and further studies were recommended.

The Lake Dauphin Study Committee was formed in 1978 at the request of the Turtle River Watershed Conservation District. It was made up of members from the Rural Municipalities of Ochre River and Dauphin, the Town of Dauphin, and the Turtle River Watershed Conservation District. Its purpose was to coordinate the interests and concerns of the municipalities surrounding Dauphin Lake and the various groups affected by Dauphin Lake, collect data, identify the problems and design a remedial program.

The study committee identified the following four major problem areas relating to Dauphin Lake:

1. Increasing siltation;
2. Degradation of water quality;
3. Disagreement among the different interest groups on the optimum lake levels;
4. Absence of data to determine the most acceptable practical lake level.

In December 1978, the Dauphin Lake Working Group, and inter-departmental Committee was established pursuant to a request by the

Honourable A. Brian Ransom, Minister of Mines, Natural Resources and Environment, dated November 1, 1978, for a report outlining the studies that would be required to identify solutions for "problems concerning siltation, water levels and eutrophication at Dauphin Lake."

The Dauphin Lake Working Group addressed itself to the following questions:

"1. What information or studies are required

   a) to identify the optimal range of regulation for Dauphin Lake, and

   b) to determine the extent of problems related to eutrophication and siltation and to determine the feasibility of solving these problems?

2. What would be the estimated time and cost of obtaining this information or completing these studies? " *

The Committee concluded that various studies were necessary to identify the problems and potential solutions regarding siltation, eutrophication and water level regulations of Dauphin Lake and that the estimated costs of the studies would be between $300,000 and $700,000. It further concluded that it would take three to five years to complete the studies, and also stated that:

" It should be noted however, that even if the studies as outlined are undertaken, it may not be possible or practicable to solve the problems at Dauphin Lake, particularly those related to eutrophication and siltation."*

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* Dauphin Lake Working Group, Manitoba Department of Mines, Natural Resources and Environment, March 1979 - Dauphin Lake Study Proposal, Winnipeg, Manitoba

The Water Resources Branch of the Manitoba Department of Natural Resources prepared a report in October, 1981, respecting the proposal to raise the 853.' - 854.3' (259.99 m - 260.39 m) range of regulation on Dauphin Lake to 854.' - 855' (260.29 m - 260.60 m). It also prepared a report in September, 1982, entitled Dauphin Lake Sedimentation Study. "The purpose of this study was to quantitatively analyze sedimentation in Dauphin Lake and determine a reliable sedimentation rate for the lake."* The findings of both of these reports are discussed in greater detail in Chapters V and VI.

II. BACKGROUND

It is apparent that the regulation of Dauphin Lake has, over the past fifty years, been a source of concern and conflict among various interest groups, with agriculture generally desiring low levels to permit increased native hay production, recreation desiring moderate levels to provide suitable depths for boating and swimming, while wildlife and fisheries desiring moderate to higher levels to improve vegetation and habitat in the peripheral marshes of the lake.

In an effort to satisfy these varied interests, the Province of Manitoba, in 1931, constructed the first control structure for Dauphin Lake on the Mossy River, approximately 1.5 miles (2.4 km) downstream of the Lake, which was commonly referred to as the Mossy River Dam. In the late 1940's this dam, which was a timber crib rock-filled stop log structure, was declared beyond repair and the need for replacement was emphasized. Following investigations, the Prairie Farm Rehabilitation Administration, in 1960, recommended that a new dam be built at Terin's Crossing on the Mossy River at the outlet of Dauphin Lake. The main reason for moving the location of the dam was to alleviate the flooding of approximately 200 acres (80.97 hectares) of land between the outlet of the lake and the Mossy River Dam.

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* Penner, F. & R. Oshoway, (September 1982) Dauphin Lake Sedimentation Study, Water Control Works Section, Water Resources Branch, Manitoba Department of Natural Resources, Winnipeg, Manitoba

Terin's Landing Dam, commonly referred to as the Mossy River Dam, was constructed in 1962. It is a ten bay stop log structure with bays 12' (3.65 m) in width. The seat for the stop logs is located at an elevation of 850.0' (259.08 m) a.s.l., and each bay has 8 - 8" x 8" x 12.5' timber stop logs to provide a top elevation of 855.0' (259.08 m). The dam is capable of accepting stop logs up to 862.0' (262.74 m) and was designed to discharge 3,000 c.f.s. (84.95 c.m.s.) at a lake elevation of 860.0' (262.74 m). It was expected that this dam would be capable of controlling and regulating the lake to the satisfaction of all interest groups. Time, however, has proven that while it was able to raise the minimum level of the lake, it could do very little to reduce the periodic high levels, and so the conflict between the various interest group continues. (Water Resources Branch indicates that for every 200 cfs outflow, with no appreciable inflow, it takes one month for the level of Dauphin Lake to drop one foot).

Historically, agriculture interests were given prime consideration when the Dauphin Lake regulations were established, but it is now apparent that some consideration must be given to such resources as fisheries, wildlife and recreation if these economies are to survive on Dauphin Lake.

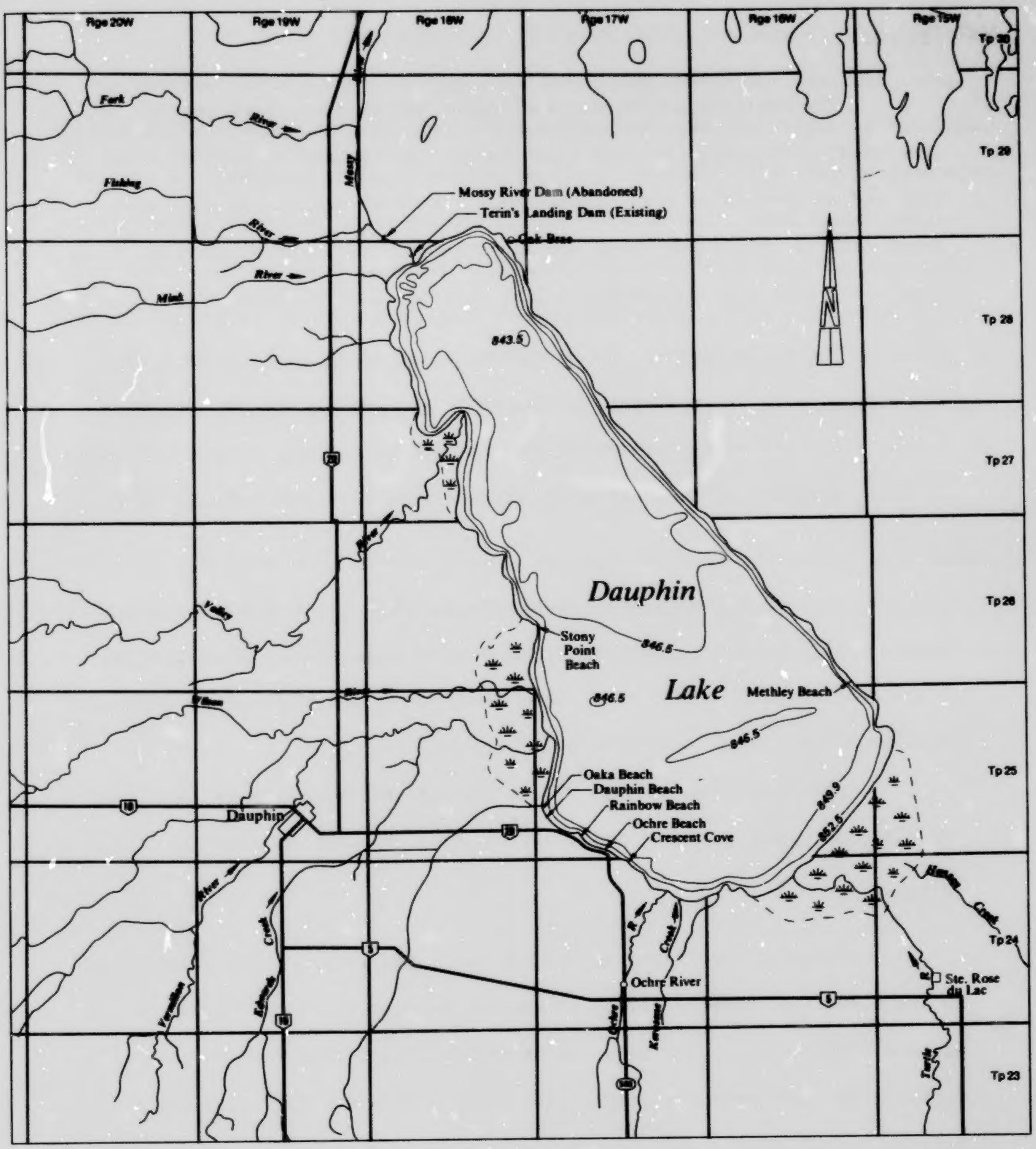
III. DAUPHIN LAKE

3.1 Physical Features

Dauphin Lake is situated approximately 190 miles (305.76 km) north-west of Winnipeg and 8 miles (12.87 km) east of the Town of Dauphin. It has a surface area of 192 square miles (497.28 km^2), covers 122,880 acres (49,728.85 hectares), has a maximum width of 12 miles (19.31 km), a maximum length of 26 miles (41.84 km), an average depth of 7.7 feet (2.35 m), and a maximum depth of 12 feet (3.66 m) at 853' above mean sea level. It has a drainage area of 3250 square miles (8417.5 km^2), bounded on the south by the Riding Mountain National Park, on the west by the Duck Mountain Provincial Park, and on the east by the divide separating Lake Manitoba and Dauphin Lake.

There are seven major streams draining into Dauphin Lake, namely: the Turtle and Ochre Rivers from the south, the Vermilion, Wilson and Valley Rivers, the Edwards Creek and Mink River from the west, and no major streams from the east. These major streams account for approximately 80 percent of the total drainage area. The Mink River and the Valley River originate in the Duck Mountains, while the remaining streams originate in the Riding Mountains. Approximately 23 percent of the total drainage area is located in the Riding and Duck Mountains. The streams which originate in the Riding and Duck Mountains originate at elevations of 2700 feet (822.96 m) and 2200 feet (670.56 m) a.s.l. respectively and fall to an elevation of 855 feet (260.60m) a.s.l. at Dauphin Lake. Additional inflow into the lake is quite probable since there are springs on the southwest shores of Dauphin Lake. However, this groundwater inflow is not believed to be significant.

The waters flow out of Dauphin Lake through the Mossy River to Lake Winnipegosis, a distance of 22 river miles (35.40 km) north of Terin's Landing Dam, with a drop in elevation of approximately 27 feet from the dam to Lake Winnipegosis.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Tp 30
Tp 29
Tp 28
Tp 27
Tp 26
Tp 25
Tp 24
Tp 23
Fork
River
Fishing
River
Mink
River
Mossy
Mossy River Dam (Abandoned)
Terin's Landing Dam (Existing)
Oak Brae
843.5
Dauphin
Lake
846.5
Stony
Point
Beach
846.5
Methley Beach
845.5
Oaka Beach
Dauphin Beach
Rainbow Beach
Ochre Beach
Crescent Cove
849.9
852.5
Valley
Wilson
River
Dauphin
River
Vermilion
Edwards
Creek
Ochre River
R.
Creek
Ochre
Creek
Ste. Rose
du Lac
Turtle
10
20
5
349

FIGURE 1:

Plan of Dauphin Lake

Water Resources Branch

Cartography by: Surveys and Mapping Branch, Manitoba 1984.

3.2 Geology

The Manitoba escarpment was formed in the cretaceous period. Its upper-most formation, the Riding Mountains, is composed of soft millwood beds and an overlay of hard Odanah shale. Glacial action has worn away a great deal of the Odanah shale and deposited a deep layer of glacial drift, consisting mostly of calcareous tills, over the soft millwood beds.

The millwood beds, which consist of 50 to 70 feet (15.24 m to 21.34 m) of soft greenish-grey shale, and which readily breaks down into sticky clay, are easily eroded by streams, and become the major contributors of fine sediments in the rivers and streams that flow into Dauphin Lake.

On the northern slope of the escarpment, near the Riding Mountain National Park boundary, wave action of glacial Lake Agassiz deposited strand lines consisting of gravel and coarse sand, which are transported down the escarpment by fast flowing streams.

The lowlands, between the escarpment and Dauphin Lake, are made up of clay and ground moraine, which is a mixture of sand, silt and clay.

Climatology

Climatic conditions within the basin differ appreciably depending on the elevation. Precipitation is generally about 2" (5 cm) higher on the eastern slopes of both the Duck and Riding Mountains than for the rest of the region. The mean annual precipitation is approximately 18" (45.7 cm) of which between 4 to 4½ inches (10.2 to 11.4 cm) comes from snowfall, and the remaining 13½ - 14" (34.3 - 35.6 cm) of precipitation falls in the summer months, which is convective rainfall that tends to be localized and intense. This can result in local flash flooding.

For example - "On September 17 to 20, 1975, the largest storm rainfall ever measured in Manitoba occurred over the Riding Mountain - Westlake area, climaxing a season high precipitation over the west central region of Manitoba. The highest measured rainfall was 294 mm (11.57 inches). The average rainfall over the Wilson Creek Watershed was 250 mm (9.84 inches). The return period for this event has been computed to be once in forty years... . The resulting runoff caused an instantaneous peak flow at the Wilson Creek weir of 44.7 m^3/s (1580 cfs). A flood frequency analysis...indicated that this 1975 peak flow has a return period of approximately once in fifty years (Booy 1980, Bowering 1982)." *

The average annual value of evapotranspiration losses are approximately 25.1 inches (63.5 cm), and the growing season loss is approximately 23.0 inches (58.4 cm) between April to October inclusive. Seepage losses, except in localized pervious soil conditins, are minor in comparison to evapotranspiration losses.

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* Committee on Headwater Flood and Erosion Control, Summary Report of the Wilson Creek Experimental Watershed Study, 1957 - 1982, Winnipeg, Manitoba 1983

3.3 Dauphin Lake Watershed Characteristics

The Dauphin Lake Watershed consists of the Upland Plateau, escarpment slope and the lowlands.

The uplands consist of the eastern and northern area of the Riding Mountains and the entire south half of the Duck Mountains. The drainage systems in this area run from the west to the east, with the eastern limit of the drainage basin lying just east of Dauphin Lake.

Main Streams within the Watershed

The Valley River

The Valley River is the largest stream within the Dauphin Lake Watershed with a drainage area of 1108 square miles (2870 km^2). The Drifting River, the Eagle, Pleasant Valley, Shant, Takw and Sulphurspring Creeks flow into the Valley River. The greatest portion of the Valley River flow originates in the Riding Mountain, with a small flow, which is very light, from the Duck Mountains. The Valley River has an over-all gradient of 0.4 percent and thus does not have a high sediment-transport capacity relative to other streams in the Dauphin Lake watershed. (Table 10) It is referred to as a low-flow stream.

Turtle River

The Hansen and Henderson Creeks flow into the Turtle River, and its total drainage area is approximately 797 mi^2 (2064 km^2). The overall stream gradient is 0.8 percent, however, the upper reaches vary from 7 percent on the escarpment down to 0.1 percent near Dauphin Lake. The runoff at the mouth of the Turtle River is relatively low, and contributes very little to the sediment load. However, the high flows and sediment coming from the escarpment escape from the stream channels and spread over the newly created deltas.

The Wilson River and Vermilion River

The overall gradient of the Wilson River (not to be confused with the Wilson Creek), is .06 percent, and of the Vermilion River, approximately 1 percent. Because of the extremely steep northern slope of the Riding Mountain, which these two streams drain, the runoff is very rapid with a heavy silt load. Channel erosion and valley deepening is very prevalent in both of these streams, but especially so in the Vermilion River and its tributary, Edwards Creek, where gradient control structures and a sediment trap were installed. The Brown, Renicker, Ranch and Mineral Creeks flow into the Wilson River, whose drainage area is 357 mi^2 (925 km^2).

The Salt, Maple, Spruce and Edwards Creeks flow into the Vermilion River and have a drainage area of roughly 287 mi^2 (743 km^2).

Ochre River

The Ochre River has an overall gradient of almost 2 percent and the highest rate of runoff per square mile of any of the streams within the Dauphin Lake Watershed. It is extremely prone to flooding, erosion and destruction of land immediately below the escarpment. Part of the Crooked Creek flows into the Ochre River: As a result of a drainage diversion, the other part of Crooked Creek flows directly into Dauphin Lake. The drainage area of Ochre River covers approximately 133 mi^2 (344 km^2).

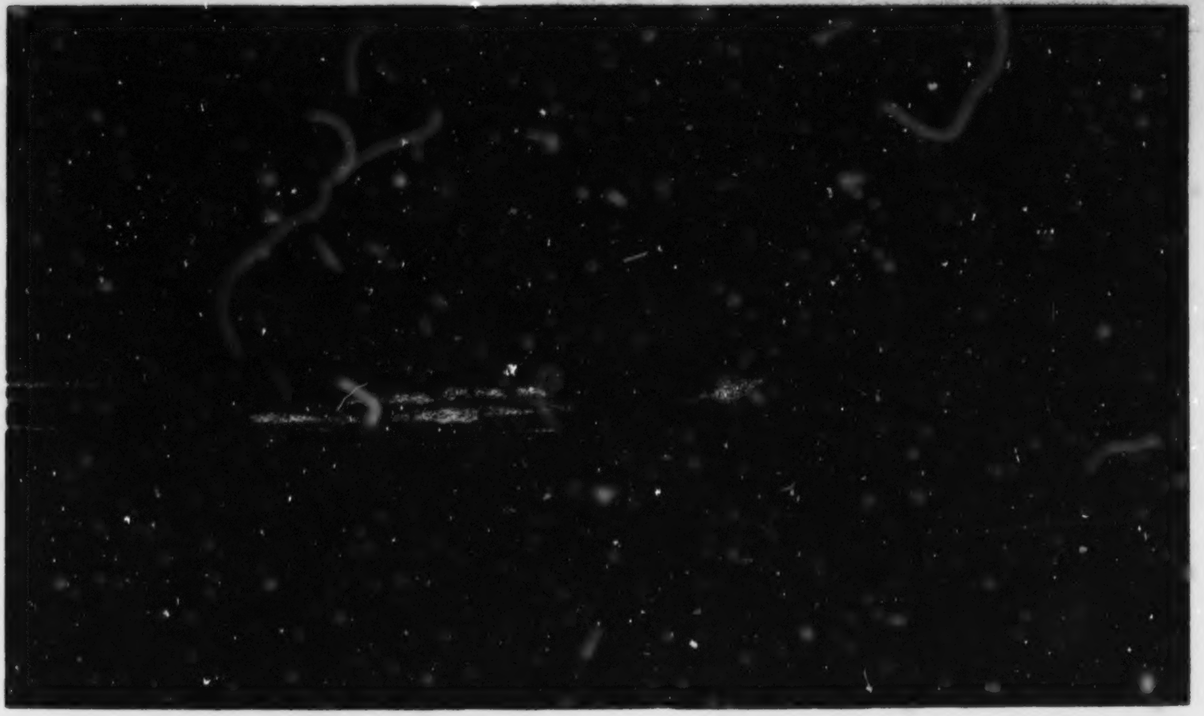
Edwards Creek

Edwards Creek lies between the Vermilion and Ochre Rivers. It has a drainage area of approximately 120 mi^2 (311 km^2), of which approximately 45 percent lies on the northern edge, and within the boundaries, of the Riding Mountain National Park. This latter area, along with the western and eastern tributaries of Edwards Creek are major sources of high sediment load. The overall gradient of Edwards Creek is 1.9 percent.

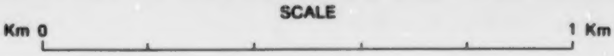
It should however, be noted that Edwards Creek has been artificially modified more extensively than any other waterway running into Dauphin Lake. Large portions of both Edwards Creek and Jackfish Creek were straightened out (after 1948) in the lower watershed area between the Town of Dauphin and the Lake, which considerably increased the velocity of flow and the quantity of sediment passing through these channels. Prior to 1948 Edwards Creek flowed into the Vermilion River and thence into Dauphin Lake. Likewise the Jackfish Creek, which originates in the Riding Mountain, previously flowed into a marshy area surrounding the Vermilion River.

However, because of widespread flooding between the Town of Dauphin and Dauphin Lake, an 11.4 mile floodway was constructed between 1948 to 1951 to divert the flows from both the Edwards and Jackfish Creeks directly into Dauphin Lake at a point approximately 10 miles east of the Town of Dauphin and about one half a mile north of Oaka and Dauphin Beaches. The establishment of this new point of entry to the lake caused the development of a delta at the mouth of the Edwards Creek drain, which clearly demonstrates the volume and rate of siltation occurring in Dauphin Lake and underlines the problem that exists. Figure 2 shows aerial photographs of Edwards Creek Drain taken in 1950 and in 1962 and indicates the development of this sediment delta.

A settling or silt basin was constructed south-west of the Town of Dauphin to reduce the silt carried by Edwards Creek into Dauphin Lake. The trap is now full, but while it was in operation, it was very effective in removing the relatively high sediment load carried by Edwards Creek into Dauphin Lake.



1950 photo of Edwards Creek Drain just after construction



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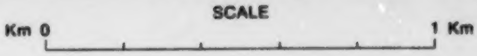
1962 photo of Edwards Creek Drain showing deposition of sediment delta



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Km 0
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FIGURE 2:

Cartography by: Surveys and Mapping Branch, Manitoba 1984.

Mink River

The Mink River, which originates in the Duck Mountains has a drainage area of approximately 106 mi^2 (274 km^2) and is the smallest of the major tributaries flowing into Dauphin Lake. It has an overall gradient of .57 percent.

TABLE 1[*]

MAJOR TRIBUTARIES	DRAINAGE AREA	
	Square Miles	Square Kilometers
Valley River Watershed	1108	2870
Turtle River Watershed	797	2064
Vermilion River Watershed	287	743
Wilson River Watershed	357	925
Ochre River Watershed	133	344
Edwards Creek Watershed	120	311
Mink River Watershed	106	274

3.4 Dauphin Lake Shoreline

The shoreline of Dauphin Lake is varied. The shoreline on the east side of the lake from Oak Brae to Methley Beach rises sharply. Elevations of 862 feet (262.73 m) and 875 feet (266.70 m) are within 100 feet (30.48 m) and 1000 feet (304.8 m) from the shoreline respectively. From Oak Brae to Mink River on the north side of the lake, the shoreline is low and flat.

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[*] Inland Waters Directorate, 1983 - Surface Water Data Reference Index Canada 1983 Water Resources Branch, Water Survey of Canada - Ottawa, Canada

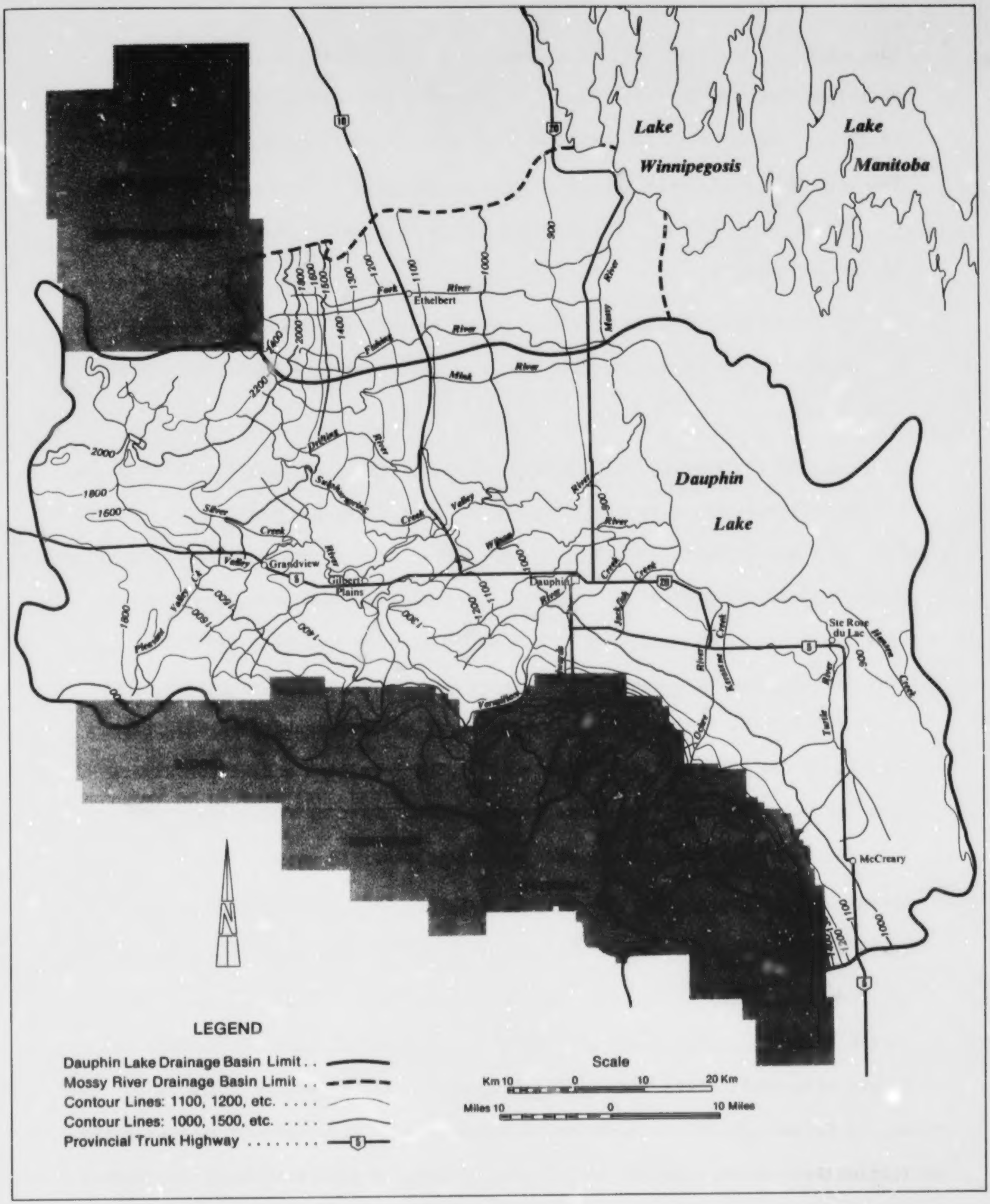
Lake Winnipegosis
Lake Manitoba
Dauphin Lake
Ethelbert
Fork River
Fishing River
Mink River
Mossy River
Drifting River
Sulphur Spring Creek
Valley River
Silver Creek
Wilson River
Grandview
Valley
Gilbert Plains
Pleasant Valley
Dauphin
Vermillion
Jackfish Creek
Edwards Creek
Turtle River
Ochre River
Ste Rose du Lac
Hamson Creek
McCreary
N
10
20
5
1100
1200
1300
1400
1500
1600
1800
2000
2200
1000
900
LEGEND
Dauphin Lake Drainage Basin Limit
Mossy River Drainage Basin Limit
Contour Lines: 1100, 1200, etc.
Contour Lines: 1000, 1500, etc.
Provincial Trunk Highway
Scale
Km 10
0
10
20 Km
Miles 10
0
10 Miles

FIGURE 3:

Plan of Dauphin Lake Drainage Basin

Cartography by: Surveys and Mapping Branch, Manitoba 1984.

Elevations of 862 feet (262.73 m) are located 100 feet (30.48 m) from the shoreline, but the 875 foot (266.70 m) contour extends two or more miles (3.22 km) inland with low flat land in between the shore and the contour. The same type of terrain extends to the Valley River with the exception that to the west the 875 foot (266.7 m) elevation is within 1.5 miles (2.41 km), of the lake shore.

There is a delta at the mouth of the Valley River that extends 1.5 miles (2.41 km) into the lake at an elevation of approximately 856 feet (260.90 m).

On the west side of the lake from Valley River to Stony Point Beach, the shoreline rises to an elevation of 862 feet (262.73 m) within a few thousand feet of the lakeshore, and the 875 foot (266.7 m) contour is located approximately 2 miles (3.22 km) therefrom. There is very little marsh area along this portion of the shoreline. There is a marsh area on the south side of Stony Point along the lakeshore covering an area of approximately 10 square miles (25.9 km^2), most of which is located at elevations between 865 feet (263.65 m) and 858 feet (261.52 m) a.s.l. The Vermilion and Wilson Rivers pass through this marsh area into Dauphin Lake. Part of this area is hay land and part of the periphery area is cultivated.

On the south end of the lake from Dauphin Beach to Methley Beach, there is a beach ridge with a top elevation of 858 feet (261.52 m), to 862 feet (262.73 m) separating the Turtle River marsh from the lake. The Turtle River and Ochre River as well as other minor streams cut through this ridge. The Turtle River marsh covers approximately 21 square miles (54.39 km^2) and is farmed around the periphery with some land being used for hay. In the Turtle River Marsh, the 875 foot (266.7 m) contour passes through the Town of Ste. Rose du Lac, which is located 6.5 miles (10.46 km) southeast of the lake.

On the west side of the marsh, the 875 foot (266.7 m) elevation, however, is located within 1 mile (1.6 km) of the lakeshore.

The areas, therefore which varying levels of Dauphin Lake may affect are the Turtle River Marsh and the marshes located at the outlets of the Vermilion, Wilson and Valley Rivers, and cover approximately 31 square miles (80.29 km^2). The rest of the shoreline area is not affected to any significant degree by variations in lake levels.

3.5. Crown Land

The Crown owns approximately 45,000 acres (18,211 ha) of land in the vicinity of Dauphin Lake extending from the Riding Mountain National Park boundary north to Lake Winnipegosis. Approximately 5120 acres (2072 ha) of this land is situated on the southeast side of Dauphin Lake within a few miles of the shore. Approximately 24,320 acres (9842 ha) are situated immediately north of Dauphin Lake towards Lake Winnipegosis. The balance is scattered in the area south and southeast of Dauphin Lake (See figure 4).

IV. ECONOMY OF DAUPHIN LAKE BASIN

The economy of the Dauphin Lake basin consists primarily of agriculture with greater emphasis placed on cereal crops, and to a lesser degree, forage crops and livestock production. The area immediately adjacent to Dauphin Lake produces native hay upon which some livestock producers apparently depend. In addition, tame hay is grown on a small portion of the cultivated acreage.

The service industries, secondary manufacturing and tourism are also important to the Dauphin area, but to a lesser degree. Over the past few years secondary manufacturing and tourism increased somewhat, although the population in the Town of Dauphin and surrounding municipalities has declined from 19,255 residents in 1961 to 18,064 in 1982. (Table 2)

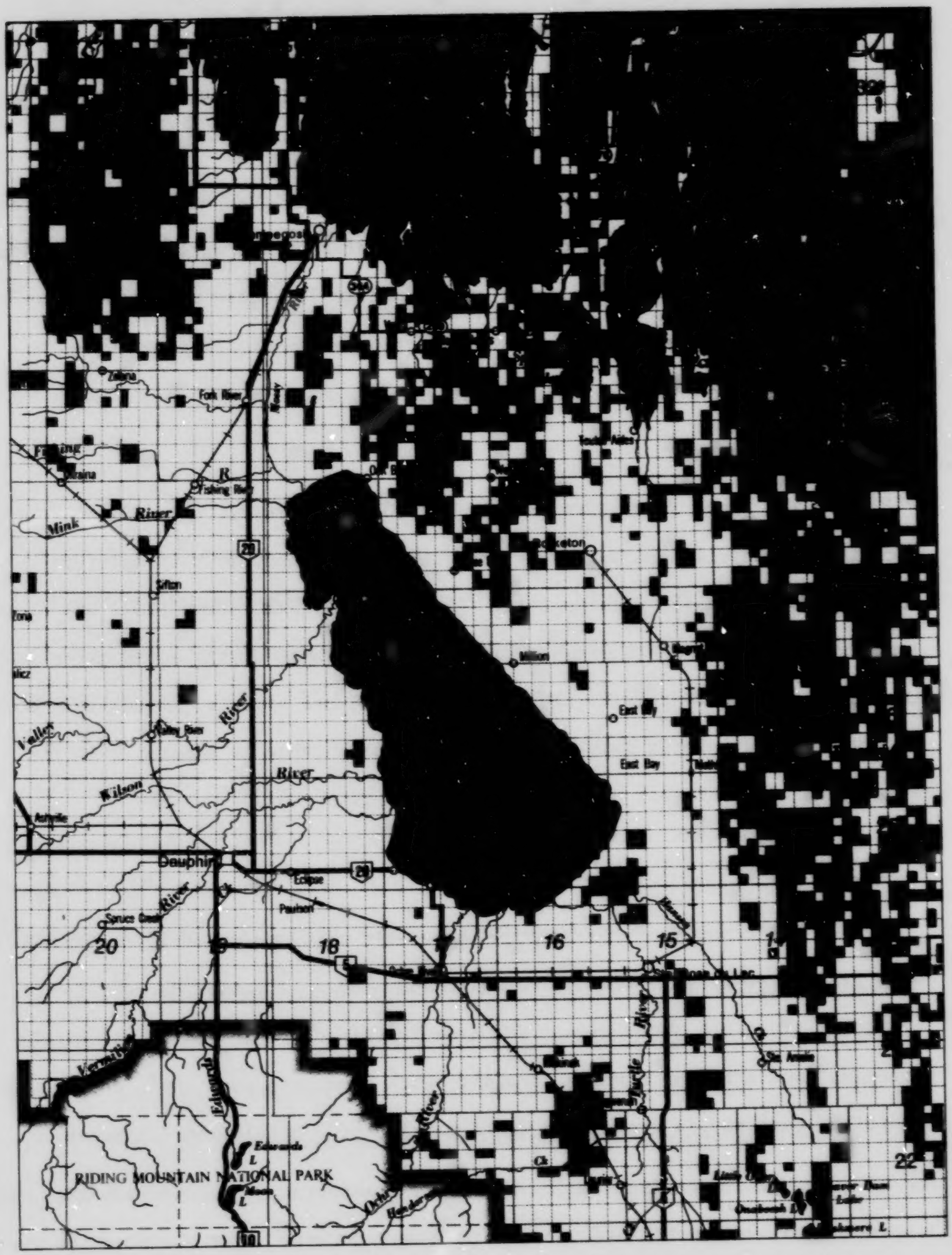
Fork River
Fishing River
Mink River
Sifton
Valley River
Wilson River
Dauphin
Eclipse
Paulson
Spruce Grove
Rorketon
East Bay
20
18
17
16
15
22
RIDING MOUNTAIN NATIONAL PARK
Edwards L
Moon L

FIGURE 4:

■ Crown Lands Dauphin Lake Area

Cartography by: Surveys and Mapping Branch, Manitoba 1984.

TABLE 2

POPULATION *

	1982	1980	1979	1978	1977	1976	1975	1966	1961
Town of Dauphin	8971	9265	9265	9265	9109	9109	8891	8655	7374
R.M. of Dauphin	2943	2931	2931	2931	3087	3087	3166	3547	3949
R.M. of Ochre River	1110	1085	1085	1085	1085	1085	1152	1238	1391
R.M. of Mossey River	1061	1202	1202	1202	1202	1202	1438	1707	1918
Village of Winnipegosis	855	893	893	893	893	893	887	908	980
R.M. of Lawrence	866	958	958	958	958	958	1099	1264	1332
R.M. of Ste. Rose	1168	1117	1117	1117	1117	1117	1225	1351	1521
Village of Ste. Rose	1090	1038	1038	1038	1038	1038	818	792	790
TOTALS	18064	18489	18489	18489	18489	18489	18676	19462	19255

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* 1961 - 1982 - Department of Municipal Affairs, Manitoba
Statistical Information Respecting the Municipalities of the Province of Manitoba

4.1 Agriculture

As indicated previously, the economy of the Dauphin Lake region is predominantly agriculture, consisting primarily of mixed farming.

The majority of the soils in the vicinity of the south and west shores of Dauphin Lake are carbonated, and many are saline, which affects the crop growth. These soils are classified as imperfect and poorly drained. The degree of salinity determines the severity of its influence on types of crops grown on this land. Salinity of both soil and groundwater limit the land use to native hay production.

Immediately adjacent to the shores of Dauphin Lake, the majority of the soils are under native vegetation such as reeds, sedges, willow and meadow grasses. When drainage conditions permit, some of this native hay is harvested and used for livestock production. Department of Agriculture representative, Garnet E. Maynard, following a survey conducted in 1983 of the farmers with native hayland adjacent to Dauphin Lake, concluded as follows: "Results of this survey and others similar to it indicate well established tame forage crops are the only reliable source of hay. Native hay crops, whether affected by water or drought are not reliable and can only be considered as a bonus when conditions are optimum for their growth and harvest".*

The soils above the 875 feet (266.7 m) a.s.l. elevation are more suitable for intensive agriculture than the soils immediately adjacent to the lake.

Increased flooding on the poor land adjacent to the lake would reduce the agricultural productivity of hay and livestock, but could possibly provide additional benefits from increased productivity of waterfowl and wildlife.

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* Letter from Garnet E. Maynard, Grassland Specialist, Northwest Region, Department of Agriculture - dated October 27, 1983 - addressed to the Manitoba Water Commission

It was determined by the Manitoba Water Commission, in its report on Dauphin Lake, 1973, from data made available to it at that time, that reclamation of the Turtle River Marsh and the deltaic areas of the Vermilion, Wilson and Valley Rivers for agricultural purposes was not economical.

In June, 1974, the water level of Dauphin Lake rose approximately 5 feet from 854.5 feet (260.45 m) to 859.34 feet (261.93 m) to cause one of the most damaging floods in the region. A total of 27,065 acres (10,953 hectares) of land was flooded and the cost of lost production was approximately one million dollars. The following table shows the breakdown of areas flooded, land use and land values. Crown land is included in these figures.

TABLE 3*

Rural Municipality	1974** Flooded Acres	Claimed Flooded Acres
Dauphin & Mossy River	10,372	10,061
Ochre River	8,630	5,578
Ste. Rose du Lac	8,063	6,240
TOTAL:	27,065	21,879***

*** includes approximately 2500 acres of Crown Land

Value of Lost Production Per Acre:

Land Use	Number of Acres	Value of Lands Flooded Per Acre	Claim Value of Land Flooded, Per Acre
Tame Pasture	763	$50.00	$50.00
Wild Pasture	5,872	25.00	35.00
Tame Hay	1,608	50.00	50.00
Wild Hay	10,862	30.00	35.00
Cultivated	2,774	75.00	100.00
TOTAL:	21,879		

** Flooded acreage is determined as the difference in the area flooded between a Dauphin Lake level of 854.5' and the maximum lake level during the 1974 flood at 859.34' a.s.l.

* Departmental Memo dated July 21, 1975 from J. Arthur, Planning Engineer to L. J. Whitney Project Studies re: Dauphin Flood, 1974

4.2 Fisheries

Commercial fishing, under regulation, began on Dauphin Lake in 1915. Over the years Dauphin Lake has been regarded as one of the more productive lakes in Manitoba. In 1929 its fish production was 11.5 lbs. per surface acre, which is considered as an exceptional yield. (It should be noted that Fisheries Biologists from the Freshwater Institute indicate that the average age of a fish catch is four years. Thus optimum conditions for the hatch affect production yields four years later). Dauphin Lake, however, was not only a heavy fish producer, but also a high quality producer, with the greatest percentage of the catch being walleye (pickerel). In recent years production of the more valuable species has declined drastically, whereas the lower value species such as carp, pike and suckers have increased considerably. (figure 5) This has produced a negative effect on the economic performance of commercial and sport fisheries and recreational industries in the area.

While it must be acknowledged that 1929 was an exceptionally productive year, and that the highly productive years of the thirties to the fifties may not be entirely regained, nevertheless, Dauphin Lake does have the maximum potential of producing 800,000 lbs. of fish annually. "Theoretical fish producing potential of this lake, considering area, mean depth and alkalinity, has been calculated at 6.5 lbs. of fish per surface acre."*

Because it once had a substantial commercial and sport fishery, Dauphin Lake and its watershed have been selected as the site for a joint Federal/Provincial research project which began in 1982, to study and develop techniques for rehabilitation of commercial and recreational fisheries in the fresh waters of Canada, with specific emphasis on walleye enhancement. It is believed that walleye can be rehabilitated in the lake by development and implementation of

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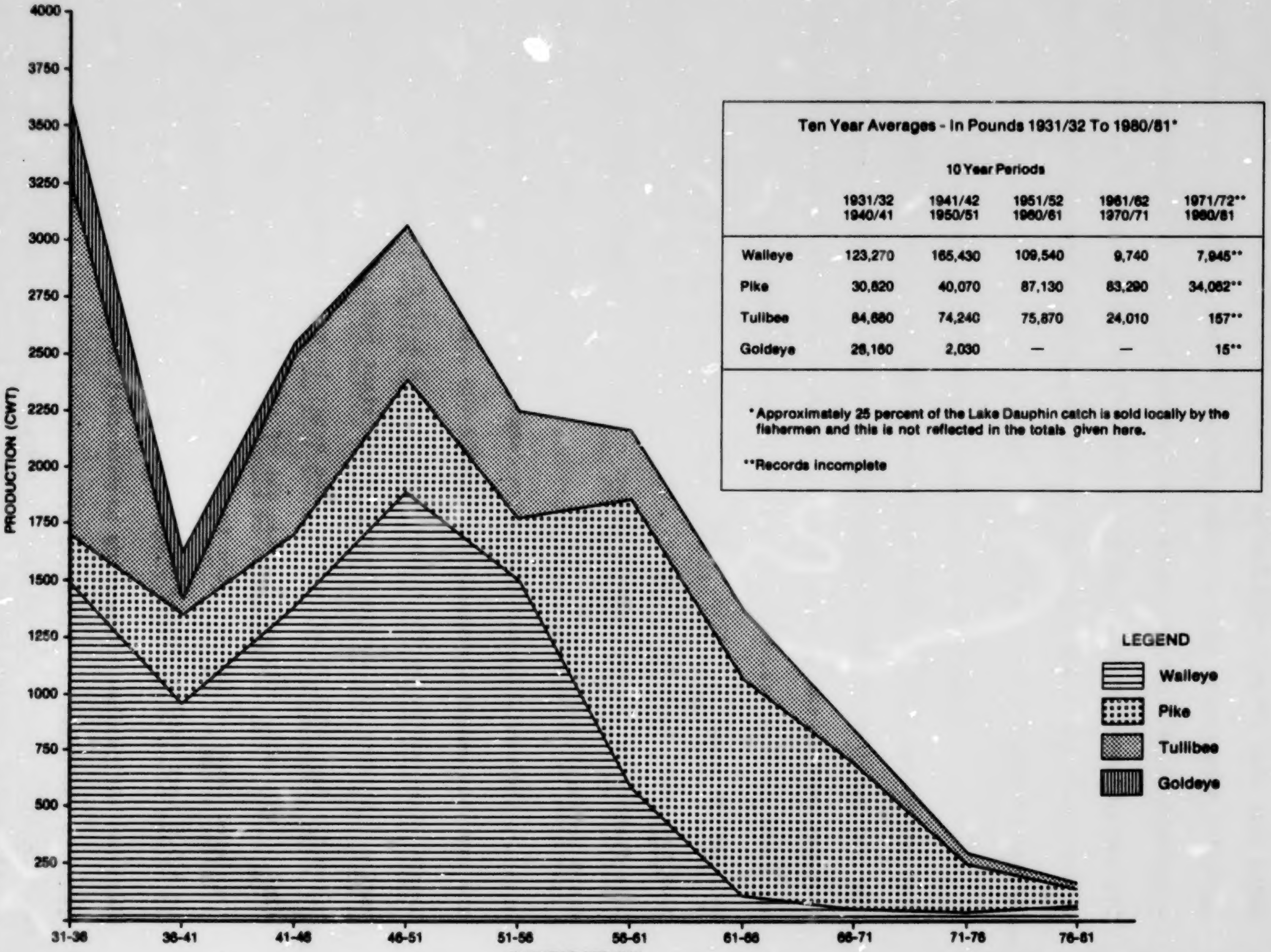
*Howard, W. 1972, Lake Dauphin Regulation and the Fishery Resource, Department of Mines, Resources and Environmental Management, Winnipeg, Manitoba

Dauphin Lake Commercial Fish
Production 1931 to 1981
By Species



Ten Year Averages - In Pounds 1931/32 To 1980/81*

	10 Year Periods				
	1931/32 1940/41	1941/42 1950/51	1951/52 1960/61	1961/62 1970/71	1971/72** 1980/81
Walleye	123,270	165,430	109,540	9,740	7,945**
Pike	30,820	40,070	87,130	83,290	34,062**
Tullibee	84,680	74,240	75,870	24,010	157**
Goldeye	26,160	2,030	—	—	15**

*Approximately 25 percent of the Lake Dauphin catch is sold locally by the fishermen and this is not reflected in the totals given here.

**Records incomplete

Source: Fisheries Branch, Department of Natural Resources

FIGURE 5:

Cartography by: Surveys and Mapping Branch, Manitoba 1984.

stream habitat improvements and utilization of fish rearing ponds. It is also hoped that this project will prove successful and serve as a prototype for fisheries enhancement in other fresh waters in Canada. "The program is intended to achieve significant increases in the harvests of walleye, thereby providing increased incomes to fishermen and shore workers, encouraging regional development in depressed areas, and improving the well being of groups dependent upon the fishery resource."*

Sport fishery on Dauphin Lake is presently of much greater importance than commercial fishery. Approximately 130,000 lbs. of sport fish (pickerel, pike and perch) were harvested by anglers in 1969/70. It was further estimated that for every pound of fish caught by an angler, between three and four dollars are spent on supplies, etc., thus giving sport fishery an approximate of $450,000.00 annually. This, added to the annual value of commercial fishery, plus the local fishermen's sales, results in a maximum economic worth of Dauphin Lake fishery in the approximate amount of one-half million dollars annually. (1970 dollars).

Between 1931 and 1945, when commercial fish production was high, the reported annual average being 300,000 lbs., the water level at Dauphin Lake was below 854.5 feet (260.39 m) a.s.l. during eight years of this period. (figure 6). During four of these eight years, the water level was below 853 feet (259.99 m) a.s.l. The water level was above 854.5 feet (260.45 m) a.s.l. only seven times out of the fifteen year period. The regulated level of Dauphin Lake from 1935 to 1947 was 854.5 feet (260.45 m) to 855.0 feet (260.60 m) a.s.l.

It is also interesting to note that in the report prepared August 1, 1935, by the Games and Fisheries Branch of the Department of Mines and Natural

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*Canada Department of Fisheries and Oceans (January 1983), Fisheries Rehabilitation Research Program - Background and Planning Document ,(J. F. Flannagan, et al)

Resources, reference was made to the divided opinion on the origin of the heavy production of fish in the shallow waters of Dauphin Lake, "...one idea being that Lake Dauphin fish belong to and migrate from Lake Winnipegosis, and the other that Lake Dauphin is an excellent breeding place for fish repleneshing its fish supply through and with the spawning facilities provided by the six streams from the Riding and Duck Mountains which empty into it."* The Department also commented in its report, on the Mossy River Dam which was opened in 1933.

"The dam has been opened and water levels are high enough for the free passage of fish in the Mossy River. These changed water levels may have some influence on the future production of Lake Dauphin and will be closely watched by all interested parties."*

It appears that the Mossy River Dam did not affect fish production, since it remained high throughout the 1930's, 1940's and 1950's. However, since 1960, commercial fish production and the valued species have declined drastically. The deline in fish production coincides with the construction of the new dam at Terin's Landing on the Mossy River. This raises the question as to whether the fish ladders at the dam are operating effectively.

A number of studies have been done, and reports written, over the past several years on the fisheries resource in Dauphin Lake. The Dauphin Lake Study Proposal of 1979 concluded that any further studies regarding the effects of Dauphin Lake levels on fisheries would be of minimal value. It further concluded that "slightly higher lake levels would have only a minor positive influence on the fishery", and that "excessively high waters would result in nutrient leaching and erosion of shorelines which would add to lake and river eutrophication and siltation.*

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*Cunningham, A.G. (August 1935), Remarkable Productivity of Lake Dauphin, Games and Fisheries Branch, Manitoba Department of Mines and Natural Resources, Winnipeg, Canada

The main problems were identified as lack of control over seasonal levels of the lake, the quality, quantity, extent and duration of stream inflow into the lake. Fast waters in the spring induce the fish to move upstream in search of spawning areas. However, because of the improved drainage systems, runoffs are rapid and the periods of continuous stream flow are greatly reduced. Sometimes the runoffs end abruptly leaving the fish stranded in shallow pools, or the eggs are left "high and dry" before they have had a chance to hatch.

This view has been supported by fisheries biologists engaged in the joint research project referred to herein. They state that "Historical information suggests that most or all of the streams (flowing into Dauphin Lake) had significant spawning runs."** Two main factors which appear to be involved in the decline of the spawning habitat are (1) physical barriers, such as ford crossings and culverts which increase the water velocity beyond that which the fish can swim; and (2) alterations in the flow regime due to changes in drainage and straightening of stream channels.

Pokrant and Gaboury in their study of the Valley River Watershed in 1983 indicated that the increase in land clearing and drainage facilities resulted in increased peak flows and also rapid recession of water in the Valley River which is very detrimental to fish spawning.

It would appear that there is no singular cause for the decline in the fish population in Dauphin Lake, but that several factors may be responsible i.e. (1) the fish ladders at Terin's Landing Dam, (2) the destruction of spawn in the streams due to improved drainage systems and rapid spring runoffs, and (3) the level of the lake.

* Howard, N.W. - 1979 Dauphin Lake Study Proposal

** Fisheries Rehabilitation Research Program - Background and Planning Document

A solution to the fisheries problem recommended by W. N. Howard is to seriously consider the feasibility of constructing a series of upstream reservoirs. These reservoirs could serve as fish rearing ponds and provide a control over the inflow into the lake. By controlling the inflow, there would be a reduction in nutrient leaching, siltation and erosion as well as an amelioration of the water level problems.

4.3 Recreation

The shoreline of Dauphin Lake serves as a recreational area for people from the Town of Dauphin, Ste. Rose du Lac, and surrounding municipalities. There are several beaches along the shoreline, two of which are operated by the Parks Branch of the Province of Manitoba, namely: Rainbow Beach and Methley Beach, situated on the south-west and south-east ends of the lake, respectively.

The Rural Municipality of Dauphin operates a public beach at Stoney Point, which is situated on the west side of Dauphin Lake and north of the Wilson River.

Other beaches, Oaka, Dauphin, Laguna, Ochre and Crescent Cove are situated at the south end of Dauphin Lake where the majority of the cottages are located.

TABLE 4**

Beaches	Number of Cottage Owners			
	1960	1970	1980	1982
Oaka	23	16	36	36
Dauphin	105	107	120	120
Laguna	0	21	22	22
Ochre	69	78	85	85
Crescent Cove	34	34	34	34
TOTAL	231	256	297	297

** Information received from the R.M. of Ochre River

There are currently two sub-divisions being developed at the Dauphin Beach and Oaka Beach areas.

A population of approximately 18,000 people living in the vicinity of Dauphin Lake regard this lake as an important recreational resource and place great value on the water oriented facilities which it provides. This view was reinforced at the public hearings held in 1982.

The 1972 Canada Land Inventory Classification of Outdoor Recreation on Dauphin Lake classified six of the beaches at a class 2 rating and one beach received a class 1 rating. It is apparent that Dauphin Lake has been rated as a very good beach and swimming area, and is therefore significant provincially as a lake capable of providing high quality recreational beaches.

Rainbow Beach, located on P.T.H. #20, 13 miles (20.92 km) east of the Town of Dauphin, is the major provincial recreational facility on Dauphin Lake. It has a thirty-six unit campground, with kitchen facilities, picnic area and children's playing equipment, which is used extensively by local residents.

In 1983, 83 percent of the users of the campground were Manitoba residents. The 1968-1983 average shows that 77.4 percent of the users were Manitobans. (Table 5)

The number of camping permits sold at Rainbow Beach in 1983 was 1413. This is an increase of 1107 over the 1968 figure of 306. Similarly the revenues received from permit sales increased from $692.00 in 1968 to $11,130.00 in 1983.* (Table 6)

Because of the importance of the recreational resource at Dauphin Lake, the Parks Branch has a capital development project underway which consists of a new 80-unit campground, group users area and boat launch.

*1983 Figures are preliminary

Methley Beach has a 15-unit campground, and is used by local residents primarily, although in the fall, American duck hunters also use the facility.

Stoney Point Beach, which is operated by the Rural Municipality of Dauphin, has a 40-unit campsite. The revenue received from these units by the Municipality was:

1970 - $ 375.00
1980 - 700.00
1982 - 2075.00
1983 - 1641.00*

(figures received from R.M. of Dauphin)

Visitor surveys, taken by Provincial Park authorities, indicate that 90 percent of all visitors to provincial parks engage in such activities as swimming, boating and fishing. A 1981 survey of visitors to Rainbow Beach indicated that 30 percent rated the beach conditions as unsatisfactory. These conditions which include poor water quality, high algae content, loss of beach foreshore to vegetation growth and silt, low water levels and too much beach are directly related to the problems of siltation, eutrophication and water levels of Dauphin Lake.

In the 1972 Lake Dauphin Regulation Study, the Parks Branch recommended that the Dauphin Lake level be 855 feet (260.60 m) a.s.l. In 1982, in a brief presented to the Manitoba Water Commission, the Parks Branch again recommended an increase in water level. (See page 95).

* 1983 figures are preliminary

TABLE 5**

RAINBOW BEACH CAMPGROUND

Percentage of Total
Users by Place of Origin

ORIGIN OF PERMIT HOLDERS	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983*	Average 1968-1983
MANITOBA	77	79	74	75	77	80	75	73	77	80	77	78	78	75	81	83	77.49
OTHER CANADIANS	12	11	14	11	12	12	15	17	15	13	16	17	17	18	13	12	14
U.S.A.	11	10	12	12	11	8	10	9	7	6	6	4	5	6	5	4	7.88
OTHER	0	0	0	2	-***	-***	0	1	1	1	1	1	-***	1	1	1	.63
TOTAL	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

*1983 preliminary figures

**Compiled from recorded data received from Parks Branch - Department of Natural Resources (Manitoba)

***Less than 1%

TABLE 6***

RAINBOW BEACH CAMPGROUND

YEAR	NUMBER OF SITES	TOTAL OPERATING DAYS	UNIT DAYS AVAILABLE	UNIT DAYS SOLD	NUMBER OF PERMITS SOLD	REVENUE
1968					306	$ 692.00
1969					537	1,537.00
1970	54 (30* 24**)				773	2,257.50
1971	39 (15* 24**)			1452	926	2,410.00
1972	39 (15* 24**)	115	4485	1846	1082	3,081.50
1973	30 (6* 24**)	135	4050	1847	1169	3,099.00
1974	30 (6* 24**)	121	3630	2094	1050	3,522.50
1975	50 (10* 40**)	138	6900	2631	1169	7,273.50
1976	50 (10* 40**)	137	6850	2734	1730	7,472.00
1977	35 (5* 30**)	137	4795	1653	1155	5,460.00
1978	37 (7* 30**)	137	5069	1475	1037	7,022.00
1979	37 (7* 30**)	137	5069	1630	1210	7,632.00
1980	37 (7* 30**)	144	5328	1653	1083	7,152.00
1981	36 (6* 30**)	144	5184	1906	1290	8,528.00
1982	36 (6* 30**)	137	4932	1797	1219	9,413.00
1983****	36 (6* 30**)	129	4644	2200	1413	11,130.00

* Unserviced

** Electrical

*** Compiled from recorded data received from Parks Branch – Department of Natural Resources (Manitoba)

**** 1983 Preliminary figures

4.4 Wildlife

While Dauphin Lake is an important staging area for ducks and geese, its use for waterfowl production has generally been insignificant due to the uncontrolled fluctuations in water levels. Following those years when water levels were high, i.e. 1947, 1974 and 1975 floods, the production of waterfowl did increase substantially. During the period from 1974 to 1976 it was estimated that the number of ducks on both the lake and the Turtle River Marsh ranged from 55,000 to 85,000, Canada Geese ranged from 900 to 3,000 and snow geese numbered between 5,500 to 9,000.

In September, 1975, when water levels on Dauphin Lake were at or above 856.0' (260.90 m) a.s.l. the Turtle Marsh alone supported 5,000 snow geese and 1,000 Canada Geese. Two years later, September, 1977 when the lake level was 854.5' (260.45 m) a.s.l. the number of ducks counted on both the lake and marsh declined to 37,000, Canada Geese numbered 170 and snow geese dropped to 800.

It would therefore appear that there is a direct correlation between the number of staging waterfowl and the water level of Dauphin Lake. Wildlife interests believe that if an ample supply of water could be maintained, the Turtle River Marsh has the potential of supporting 50,000 ducks and 10,000 geese during fall migration.

The present fluctuations in the water levels affect the quality of the marshes and their use as nesting habitat. The wildlife interests also believe that in order for the marsh to provide adequate open water, loafing and suitable nesting habitat, the water levels in the Turtle River Marsh should be raised to 856' - 857' (260.9 m - 261.21 m) a.s.l. This level could be controlled independently of Dauphin Lake by using dikes and other control structures. "This approach would be most beneficial for waterfowl and muskrat production and in 1973 dollars was estimated at 1.1 million. In 1982 dollars, construction costs are estimated at 2.6 - 3.0 million." *

It has been estimated that the maximum muskrat potential of the Turtle River Marsh area is 18,535 of which approximately 2/3 could be harvested annually for an income of approximately $24,000.00.

In 1972, the Resources Planning Branch of the Department of Mines, Resources and Environmental Management based on data collected, concluded that the development of the Turtle River Marsh for the single purpose of wildlife enhancement was uneconomical. It was also determined at that time, that the Vermilion River and Valley River marshes along the west shore of Dauphin Lake were subjected to frequent wind tide flooding, and likewise could not be economically managed independently of the lake. These conclusions are still applicable today.

Wildlife biologists suggest that as an alternative to the costly construction of dikes and other control structures, the level of the lake should be raised to at least 856' (260.9 m) a.s.l. At this level it is estimated that approximately 5,000 acres of land would be flooded in the Turtle Marsh area.

At the current regulated upper lake level of 854.3' (260.39 m) a.s.l. very little water is retained in the marsh areas, thus creating conditions which are not suitable for waterfowl production and limited use for waterfowl staging.

*Davies, D. - Dauphin Lake Wildlife, Inter-Departmental Memo dated August 25, 1982
Manitoba Department of Natural Resources

V. REGULATION OF DAUPHIN LAKE LEVEL

The established ranges for regulating the water level of Dauphin Lake since 1935 are as follows:

1935 - 1947	854.5' to 855.0' a.s.l.	260.45 m - 260.60 m a.s.l.
1947 - 1950	854.15' to 854.65' a.s.l.	260.34 m - 260.50 m a.s.l.
1950 - 1953	854.5' to 855.0' a.s.l.	260.45 m - 260.60 m a.s.l.
1953 - 1983	853.0' to 854.3' a.s.l.	259.99 m - 260.39 m a.s.l.

From the above table, one observes that from 1935 to 1953, the difference between the regulated high and low levels of Dauphin Lake was one-half a foot, whereas from 1953 to the present, the difference between the regulated high and low levels is 1.3 feet.

The present range of 853.0' to 854.3' (259.99 m to 260.39 m) a.s.l. was recommended by the Lake Dauphin Advisory Board which was established in 1951 for the express purpose of advising the Provincial Government on the regulation of Dauphin Lake. This range has generally satisfied the agricultural community, and it is opposed to any change in the level, whereas wildlife, fisheries and recreation interests have indicated dissatisfaction with the current range because it impedes the development potential of their specific resource.

It is important to note, however, that from 1953 to 1982, when the regulated range of Dauphin Lake was set at 853.0' to 854.3' (259.99 m to 260.39 m) a.s.l., the mean monthly lake level was maintained within this range only twice, that being in 1958 and 1981. During the same period the lake reached levels above 854.3 feet (260.39 m) twenty times, and dropped below the 853.0 feet (259.99 m) level four times. (see hydrograph chart figure 6)

From June 1965 to December 1977, the lake did not fall below the 854.0 feet (260.29 m) level. It rose above 855.0 feet (260.60 m) twelve times, and above 856.0 feet(260.90 m) eight times during the seventeen year period from 1966 to 1982. (Figure 6: Hydrograph - 1933 - 1983 mean monthly elevations of Dauphin Lake at Ochre Beach).

An examination of the mean monthly elevations of Dauphin Lake indicates that it has been impossible to regulate Dauphin Lake within a 1.3 foot range, and furthermore somewhat unrealistic to expect to control the lake level within this range unless some effort is made to control the inflow, the outflow or both.

The only outlet from Dauphin Lake is through the Mossy River. The regulation of this outlet is at the Mossy River Dam, and experience has shown that it has been impossible to regulate Dauphin Lake within the 1.3 foot range, since it takes approximately one month to lower the lake by one foot through this facility (provided there is negligible inflow). Water Resources indicate that for every 200 cfs outflow it takes the lake one month to drop 1/10 of a foot.

The lake levels are greatly affected by the runoffs from the spring snow melt as well as heavy precipitation. The fluctuations in the lake level are rapid and extreme due to the extensive drainage systems in the area from the Riding Mountain and Duck Mountain to Dauphin Lake. The extreme variability is illustrated in table 7 by the Wilson River which ranges from a low of 2 cfs in 1961 to a high of 2221 cfs in 1974. The total runoff of all streams shows a similar pattern with a flow of 434 cfs in 1961 to a high of 11311 in 1974.

The wind set-up and wave action also affect the lake level. It is estimated that a storm of sufficiently long duration could cause a set-up in excess of three feet. Wave action along the shorelines, can affect levels of the lake by as much as three feet above those produced by the wind set-up.*

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* Dillon, M. M. Limited, 1972 - Engineering Study of the Lake Dauphin Basin Marshland for Ducks Unlimited (Canada) - Winnipeg, Manitoba

TABLE 7*

ANNUAL STREAM RUNOFF

	Valley River		Turtle River		Wilson River		Vermillion River		Ochre River		Edwards Creek		Mink River		Total (Gauged Streams)		
	dams^3	(cfs months)	dams^3	(cfs months)	dams^3	(cfs months)	dams^3	(cfs months)	dams^3	(cfs months)	dams^3	(cfs months)	dams^3	(cfs months)	dams^3	(cfs months	
1957	130000	1750	64800	872	72000	969	71800	966	53800	724	25300	341	7980	107	308680	5729	1957
1958	26300	354	23200	312	6470	87	10900	197	21300	287	6700	90	3190	43	98060	1370	1958
1959	60100	809	32600	439	13200	178	21300	287	36700	494	15900	214	5900	79	185700	2500	1959
1960	127000	1709	85000	1144	69500	935	68600	923	55500	747	29900	402	11300	152	446800	6012	1960
1961	6050	81	8750	118	142	2	4280	58	8310	112	3400	46	1290	17	32222	434	1961
1962	16300	219	23800	320	14000	188	13300	179	14200	191	9300	125	1570	21	92470	1243	1962
1963	25900	349	65400	880	23000	310	43000	579	46300	623	17400	234	4160	56	225160	3031	1963
1964	16400	221	28600	385	27500	370	27900	376	22200	299	10300	139	2940	40	135840	1830	1964
1965	49500	666	60200	810	49000	659	59800	805	59200	797	17500	236	6700	90	301900	4063	1965
1966	119000	1602	69600	937	79300	1067	61200	824	59800	805	16500	222	10500	141	415900	5598	1966
1967	103000	1386	69400	934	74400	1001	57900	779	42100	567	12400	167	5310	71	364510	4905	1967
1968	23700	319	34400	463	10700	144	20400	275	33100	445	9960	134	2120	29	134380	1809	1968
1969	50000	673	76400	1028	44600	600	49600	668	63000	848	18800	253	4780	64	307180	4134	1969
1970	173000	2328	103000	1386	107000	1440	91300	1228	73500	989	25700	346	11800	159	585300	7876	1970
1971	109000	1467	90400	1217	63700	857	56000	754	68000	915	18300	246	6680	90	412080	5546	1971
1972	98800	1330	71400	961	53800	724	45700	615	35600	479	12900	174	5770	78	323970	4361	1972
1973	26600	358	28400	382	10700	144	17500	236	22400	301	10200	137	2410	32	118210	1590	1973
1974	269000	3620	127000	1709	165000	2221	142000	1911	80600	1085	41300	556	15500	209	840400	11311	1974
1975	187000	2517	195000	2624	99100	1334	109000	1467	109000	1467	37200	501	11700	157	748000	10067	1975
1976	214000	2880	134000	1803	102000	1373	94500	1271	68400	921	27900	376	18700	252	659500	8876	1976
1977	28100	378	36100	486	9230	124	15700	211	34500	464	10700	144	3060	41	137390	1848	1977
1978	49200	662	39200	528	36000	485	42600	573	32300	435	12900	174	3240	44	215440	2901	1978
1979	215000	2894	123000	1655	-	-	109000	1467	65800	886	31800	428	12100	163	556700	7493**	1979
1980	39200	528	33800	455	18900	254	15800	213	19900	268	6890	93	2110	28	136600	1839	1980
1981	26100	351	37700	507	12100	163	21600	291	25600	345	-	-	2030	27	125130	1684**	1981
1982	21200	285	45400	611	20300	273	29600	398	27900	376	-	-	2640	36	147040	1979**	1982

*Environment Canada - Inland Water Directorate, Ottawa, 1983. "Historical Streamflow Summary Manitoba"

**Incomplete figures

Another factor to take into consideration in the regulation of the lake levels is evaporation losses. Generally the evaporation losses from Dauphin Lake are quite high, the average annual being 25.1" (63.5 cm)1957-81.

5.1 Effects of Lake Levels on Agriculture

Several reports have discussed the effect which raising the water level of Dauphin Lake would have upon agriculture. It was estimated that at a level of 854.0' - 855.0' (260.29 m - 260.60 m) due to the wind set-up approximately 15,000 acres (6070.4 hectares) of privately owned land would experience periodic flooding. The land situated between 854.0' (260.29 m) and 855.0' (260.60 m) would be subject to sustained flooding, while the land above the 855 feet (260.60 m) level would be flooded occasionally due to wind set-up.*

In order to provide flood protection, it would be necessary for the Crown to not only acquire all the land privately owned up to an elevation of 855.0 feet (260.60 m) i.e. 15,000 acres (6070.4 hectares), but also acquire the land up to an elevation of 856.5 feet (261.06 m) in the Edwards Creek - Wilson Marsh area, and up to an elevation of 858.5 feet (261.67 m) in the Turtle River Marsh area, to provide an allowance for the 1:100 year wind set-up. The cost of acquiring this land has been estimated at approximately $2,140,000.00.*

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* Water Management Services, Water Resources Branch, October 1982 - Proposal to Raise the Range of Regulation on Dauphin Lake from 853 - 854'to 854 - 855', Department of Natural Resources - Winnipeg, Manitoba

It was also estimated that the cost of acquiring the land situated below the 1:100 year wind set-up level, and the cost of improving the Dauphin Lake outlet channel, would amount to approximately $3,000,000.00. ($2,140,000.00 for land - 15,000 acres (6070.4 hectares), and $860,000.00 for channel improvements.)*

If the lake is maintained at a higher level, the result is higher peak elevations due to spring run-offs and heavy precipitation, and consequently, flooding of additional private land. It will also result in an increase in the duration of the flooding period on this land.

To ensure against claims for losses sustained because of flooding on privately held land in the Turtle River Marsh Area and Edwards Creek - Wilson River Marsh Area, and the Valley River Marsh Area due to 1:100 year spring peaks and 1:100 year wind set-up would require the acquisition by the Crown of an additional 6,000 acres (2428.17 hectares) of land at an approximate cost of $860,000.00. However, if flood easements could be obtained on this land, the estimated cost would be reduced to approximately $290,000.00. Thus the total cost of purchasing land up to the 1:100 year wind set-up level and the purchase of easements covering the additional land up to the 1:100 year mean monthly flood level, would be approximately $2,430,000.00.*

The cost of purchasing land to provide protection against the 1:100 year mean monthly flood level would amount to approximately $3,000,000.00.*

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*Ibid

5.2 Effect of Dauphin Lake Level on Fisheries

In 1972 Fisheries Biologist W. Howard maintained that "The nature of the inflow is more critical to fishery than is lake elevation."* However, at that time he still contended that elevated water levels on Dauphin Lake would benefit the commercial and sport fishery.

An increase of one foot in surface elevation would provide some improvement to the water quality and the fishery. The reasons given to support this contention were:

1) A larger volume of water would stay cooler longer and thus reduce algae growth. This in turn would reduce or prevent summerkills.
2) A larger volume of water would better control the rate at which dissolved levels of oxygen would fluctuate. It would also dilute inflowing nutrients and again decrease the extent of algae production.
3) A larger volume of water would allow for a more consistent discharge through peak periods of algae productions.

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* Howard, W. 1972, Lake Dauphin Water Regulation and the Fishery Resource, Department of Mines, Resources and Environmental Management, Winnipeg, Manitoba

4) Higher water levels would make more sand and gravel available in the lake itself which could be used for pickerel and tulibee spawning, and also increase the marsh area for northern pike spawning.

5) Higher water levels would also reduce the probability of winter kill.*

In 1979, W. Howard again stated that higher lake levels would have only a minor positive influence on fisheries, and that excessively high water levels would result in nutrient leaching and erosion of shorelines, which would add to lake and river eutrophication and siltation to the detriment of the fish.

It was acknowledged that an attempt to correlate long term lake levels with fish production two or three years later was unsuccessful. The short term patterns, however, were more apparent.

The conclusion was that seasonal levels are much more important. The ideal lake regulation from the fishery standpoint would be to maintain a high water level throughout the summer months, mid-summer flushing and a late fall and winter draw-down.

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* Ibid

5.3 Effects of Dauphin Lake Level on Recreation

Parks and recreation interests maintain that the present regulation level of 853.0' to 854.3' (259.99 m - 260.39 m) is not suitable for outdoor recreation purposes.

At this level large areas of lake bottom are exposed thereby creating poor water circulation and inadequate depths for swimming. Low water levels also contribute to algae growth thus reducing the aesthetic qualities of the lake, and hinder recreational boating. Dauphin Lake is a shallow lake. This combined with the low water level results in marginal boating conditions adjacent to much of the shoreline. An increase in level would increase the amount of propeller clearance at the entrance of the Rainbow Beach boat launching channel, thus improving safety and reducing dredging costs.

In 1972 the Parks Branch of the Department of Tourism, Recreation and Cultural Affairs stated that a higher water level on Dauphin Lake was necessary, and recommended that the lake level be set at 855.0 feet (260.60 m) a.s.l. It was also stated that any increase above this level would result in a loss of beach area. For every one foot increase above the 855' (260.60 m) level, 12.5 feet of beach would be lost.*

In 1982 the Parks Branch reaffirmed its position respecting the water level and recommended an increase of one and one half to two feet.

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*Planning Section, Parks Branch, 1972 - Lake Dauphin Regulation Study, Department of Tourism, Recreation and Cultural Affairs, Province of Manitoba

5.4 Effect of Dauphin Lake Level on Wildlife

There is a "strong correlation between water levels on Dauphin Lake and numbers of waterfowl",* according to Wildlife Biologist D. Davies.

It was indicated that when lake levels in the month of September were at 856.2 feet (260.97 m) or higher, waterfowl staging on Dauphin Lake and in the Turtle River marsh area were two or three times greater than when water levels in September were at or below the 855. feet (260.60 m) level.

Water levels in the Vermilion River, Valley River, Wilson River and Turtle River marsh areas, fluctuate with the surface water levels of Dauphin Lake, ranging from no water at all to depths of three and four feet.

It has been recommended that the Turtle River Marsh, like the Wilson River Marsh, be managed independently of Dauphin Lake, but this is very costly.

In 1981 Ducks Unlimited indicated that raising the water levels on Dauphin Lake would enhance the production of waterfowl in the peripheral marshes.

VI. SILTATION

As indicated previously, numerous studies have been undertaken with respect to Dauphin Lake. In addition many briefs have been presented to the Manitoba Water Commission by various groups and individuals at the different hearings which have been held in the past respecting Dauphin Lake. It is evident from the many studies and submissions that the problems of sedimentation and siltation are a common major concern.

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* 1979 Dauphin Lake Study Proposal (Davies, D.)

Data compiled from 1950 to 1980 indicates that the average sediment inflow into Dauphin Lake from its tributary streams is approximately 550,000 tons (498,956 tonnes) per year, or approximately 420 acre feet per year. Practically all of this sediment is trapped in the lake. At this rate, and assuming an equal distribution of sediment over the entire lake bed, the volume of the lake will be reduced by 4.1 inches (10.4 cm) every 100 years. Since the average depth of Dauphin Lake is 7.7 feet (2.35 m) it will take a little more than 2000 years for the lake to be filled in completely.* Long before complete infilling occurs, other critical stages in the eutrophication process will be reached. For example, larger areas of the lake will freeze to the bottom in the winter time. Also as the water becomes more shallow its quality will deteriorate and the rate of eutrophication will increase.

It is, therefore not surprising that residents of the Dauphin area, and others as well have expressed a great deal of alarm respecting the volume of silt flowing into, and remaining in, Dauphin Lake.

Fisheries biologists have recognized the negative effects of silt on the fish spawning habitats. Those supporting recreation have pointed to the detrimental effect which the build up of silt has on the swimming areas the beaches and boat access channels along the southwestern shore of Dauphin Lake, as well as the quality of the lake water.

In 1956 the Dauphin Beach Committee expressed alarm at the large quantity of sediment that was being deposited at the mouth of the Edwards Creek Floodway. The Prairie Farm Rehabilitation Administration (PFRA) was requested to investigate the silting problems, and pursuant thereto conducted topographical surveys of the settling basin and delta areas in the years 1957,

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* Dauphin Lake Sedimentation Study - September 1982

1960, 1964 and 1968, to determine the extent of sediment in the delta. Aerial photographs of the sequential development of the delta can be seen in figure 2. No remedial action was taken by Water Resources on behalf of the cottage owners. Those cottage owners directly affected had a channel dredged in front of their cottages at their own expense.

In 1968 the Sediment Survey Section of the Water Survey of Canada was requested by the PFRA to evaluate the morphology of the entire basin, with particular emphasis on the settling basin, floodway and delta. The results of this study, entitled "Morphological Study of the Edwards Creek Watershed" was reported in 1971. This study reported that the settling basin was almost filled to capacity at that time and the two possible short term solutions to maintain the effectiveness of the settling basin were identified as: (1) dredging the settling basin and (2) building dykes around the perimeter to increase the basin's capacity.

The rapid build up of the delta associated with the Edwards Creek Drain was aggravated by the fact that there was no marsh area. Marshes provide an important function as sediment traps. This report also found that the excessive rate of sedimentation manifest in the settling basin and the delta on Edwards Creek was due to erosion along the escarpment. These findings are somewhat similar to the findings of Dr. Robert Newbury's classic studies on the Wilson Creek, except that Dr. Newbury suggests that the major portion of this sediment now comes from alluvial fans at the foot of the escarpment.

6.1. Causes of Siltation

Some of the studies have indicated that the sources of sediment transported into Dauphin Lake eroded from:

1) the fields during spring runoffs (sheet erosion);
2) the banks and bottom of channels or stream (channel erosion);

3) the banks of the lake due to wave action and slumping of undercut banks (shoreline erosion).*

Over the past number of years, a high load of sediment has entered Dauphin Lake on the western side from the Valley River, Wilson and Vermilion Rivers and Edwards Creek. The nutrients contained in this sediment contribute to the eutrophication of Dauphin Lake. One of the benefits, therefore, of reducing the silt load is a reduction of nutrients in the water.

Other studies maintain that approximately 75 percent of all sediment-loading to the agricultural drainage network below the escarpment is derived from previously deposited alluvial fan area, and only about 25 percent from the escarpment itself.**

Alluvial fans are formed by the sediments brought down from the escarpment by flood flows caused by spring snowmelts and heavy rainfall. In a presentation made by Dr. Newbury to the Manitoba Water Commission, reference was made to earlier air photographs which indicate that Wilson Creek water infiltrated into the fan, and the creek did not flow on the surface beyond the foot of the escarpment. This no longer occurs as the water now flows through drainage ditches and into Dauphin Lake.

In the period between 1910 to 1930, the land in the alluvial fan area, below the escarpment, was cleared for agricultural purposes, and shallow ditches were excavated to provide the necessary drainage. These shallow ditches, which extended across the alluvial fan areas, have over the years eroded into steep-walled canyons. This has caused a marked increase in the rate of sediment flowing into the drainage channels below the escarpment. The average natural

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*1979 Dauphin Lake Study Proposal (Appendix E - N. Vitken)

**Newbury, R.W. - Erosion and Re-deposition of Alluvial Fans Due to Stream Base Level Changes Caused by Drainage Channels Below the Manitoba Escarpment, Conference on Riding Mountain Watersheds - Joint Responsibilities, Ste. Rose, Manitoba rate of sediment transport is 5300 cubic meters per year at the top of the alluvial fan, and 19,000 cubic meters per year below the canyon in the years from 1928 - 1978.*

In the Wilson Creek fan area, for example, the canyon section has not only widened and deepened, but eroded upstream at an average rate of ten meters per year. Between 1928 to 1978, 43.8 acres (17.73 hectares) from two sections of land along the Riding Mountain National Park boundary eroded into the stream bed.*

The delivery of sediment, from the now eroding fan area and the escarpment, to the drainage channels below was increased to four times the natural rate as the drainage ditch eroded into the canyon.

6.2 Sediment Deposition

In a study done by the Water Resources Branch, September 1982, entitled "Dauphin Lake Sedimentation Study", it was estimated that from 1950 to 1980 the total suspended sediment inflow into Dauphin Lake was 14,935,657 tons (13,549,521 tonnes) and the total sediment outflow was 209,709 tons (190,247 tonnes). The 14,725,948 tons (13,359,292 tonnes) difference between these two figures represents the weight of suspended sediment which was deposited into the lake during the thirty-one year period, which equals an average rate of 475,031 tons (430,945 tonnes) per year. In 1961 the suspended sediment load in the Wilson River was 80 tons, whereas in 1953 it was 111,319. Earlier reference was made to the extreme variability in runoff of water flows in these years on the Wilson River. The sediment load figures in Table 8 show the direct relationship between the water flow carrying capacity and suspended load.

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* Ibid

TABLE 8 *

COMPUTED SUSPENDED SEDIMENT LOADS

AT GAUGING STATIONS (TONS)

Year	Mink Creek at P.T.H. #20	Valley River Near Dauphin 05LJ010	Wilson River Near Dauphin 05LJ011	Vermillion River Near Dauphin 05LJ012	Edwards Creek Near Dauphin 05LJ022	Ochre River At Ochre River 05LJ005	Turtle River Near Laurier 05LJ007	Yearly Totals	Mossey River Below Outlet of Dauphin Lake 05LJ025
1950	2,203	8,486	43,599	128,748	41,146	188,703	92,040	504,925	8,407
1951	4,216	15,095	31,198	76,662	21,100	59,698	40,897	248,866	4,848
1952	2,023	7,867	27,960	62,039	16,065	7,425	31,626	157,005	4,161
1953	9,521	31,119	111,319	205,111	74,964	331,307	133,065	836,406	16,498
1954	17,968	54,688	89,413	128,501	41,044	48,968	76,950	457,532	16,213
1955	7,783	26,020	68,025	124,174	39,273	142,900	92,487	500,664	15,740
1956	9,354	33,792	86,873	187,536	66,790	52,870	113,916	551,321	13,489
1957	4,978	17,093	58,015	121,625	55,398	116,396	50,665	424,170	7,491
1958	359	1,806	4,520	14,798	2,825	1,035	16,671	42,014	922
1959	984	4,213	9,067	29,015	9,207	3,597	23,497	79,580	826
1960	9,325	17,933	54,962	114,736	62,002	45,772	68,201	372,931	6,127
1961	47	162	80	4,938	933	226	6,031	12,417	1,299
1962	137	1,485	10,409	19,572	3,620	266	17,865	53,354	582
1963	586	1,320	16,408	63,833	13,631	10,609	50,008	156,395	287
1964	474	1,031	20,809	42,824	9,777	6,775	21,491	103,181	128
1965	1,247	3,814	36,667	92,126	14,539	31,283	46,045	225,721	116
1966	8,859	13,752	62,436	97,412	13,373	41,595	53,873	291,300	8,223
1967	2,514	18,445	60,313	94,829	12,969	22,194	55,912	267,176	6,127
1968	177	1,659	7,551	26,864	4,443	2,704	24,382	68,780	513
1969	1,038	6,589	35,063	79,458	47,406	245,250	60,788	475,592	5,557
1970	5,942	24,157	86,553	154,794	44,480	247,263	83,592	645,781	10,483
1971	3,405	15,190	50,069	87,292	20,417	291,840	71,877	540,090	6,779
1972	2,915	11,035	41,558	71,283	10,583	13,925	56,382	207,683	5,862
1973	141	901	7,251	23,568	5,747	1,453	19,821	58,882	413
1974	22,689	60,820	141,797	263,659	121,442	164,943	105,753	881,103	15,938
1975	6,602	24,378	79,602	185,021	216,938	450,756	164,876	1,128,373	13,210
1976	43,917	32,138	83,479	160,579	65,173	157,599	111,842	654,727	15,633
1977	261	1,125	6,262	20,717	8,449	28,031	26,730	91,575	3,664
1978	447	4,157	27,405	64,592	8,084	7,331	27,148	141,164	4,417
1979	14,323	53,420	112,020	194,840	78,178	93,990	102,446	649,217	12,864
1980	324	4,262	14,118	22,351	1,576	937	24,913	68,481	2,772
TOTAL	184,759	498,152	1,484,801	2,963,487	1,131,572	2,819,841	1,873,792	10,956,404	209,709
MEAN	5,959	16,069	47,896	95,596	36,502	90,962	60,445	353,432	6,765

* Water Resources Branch - "Dauphin Lake Sedimentation Study", 1982

TABLE 9 *

TOTAL COMPUTED SEDIMENT INFLOW LOADS (1950-1980)

Watershed	Suspended Sediment (Tons)	Ungauged Area (mi^2)	Suspended Sediment Yield ($Tons/mi^2/yr.$)	X 31 yr.	Total Suspended Sediment (Tons)	Bed Load (15%) (Tons)	Total Sediment Load (Tons)
Mink Creek	184,759	1.25	56	2,170	186,929	28,039	214,968
Valley River	498,152	69	14	29,946	528,098	79,215	607,313
Wilson River	1,484,801	10	134	41,540	1,526,341	228,951	1,755,292
Vermillion River	2,963,487	29	367	329,933	3,293,420	494,013	3,787,433
Edwards Creek	1,131,572	65	663	1,335,945	2,467,517	370,128	2,837,645
Ochre River	2,819,841	32	683	677,536	3,497,377	524,607	4,021,984
Turtle River	1,873,792	313	161	1,562,183	3,435,975	515,396	3,951,371
					14,935,657	2,240,349	17,176,006
				ANNUAL MEAN =	481,795	72,269	554,065

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* Water Resources Branch - September 1982, "Dauphin Lake Sedimentation Study" (Winnipeg, Manitoba, Department of Natural Resources)

TABLE 10**

ANNUAL SEDIMENT YIELDS FROM COMPUTED DATA

Stream	Average Annual Susp. Sediment (Tons)	Drainage Area (mi^2)	Average Suspended Sediment Yield (Tons/mi^2/yr)	Expected* Yield (Tons/mi^{2}yr)
Mink River	5,959	106	56	no information
Valley River	16,069	1108	14	25 - 50
Wilson River	47,896	357	134	51 - 250
Vermilion River	95,596	260	367	51 - 250
Edwards Creek	36,502	55	663	50% @ 51-250 50% @ 251-1000
Ochre River	90,962	133	683	251 - 1000
Turtle River	60,445	376	161	51 - 250

*Range of values for expected yield are taken from "Suspended Sediment Yield for Canadian Rivers" map 1972 published with "Sediment Loads in Canadian Rivers" Technical Bulletin No. 74; Stichling, Inland Waters Directorate, Ottawa

**Water Resources Branch - "Dauphin Lake Sedimentation Study", 1982

TABLE 11***

COMPARISON OF RECORDED AND COMPUTED SUSPENDED SEDIMENT LOADS

	Turtle River		Edwards Creek		Vermilion River	
Year	Recorded Susp. Sed. (Tons)	Computed Susp. Sed. (Tons)	Recorded Susp. Sed. (Tons)	Computed Susp. Sed. (Tons)	Recorded Susp. Sed. (Tons)	Computed Susp. Sed. (Tons)
1966	28,134	53,973				
1967	37,270	55,912				
1968	8,580	24,382				
1969	56,686	60,788				
1970	86,865	83,592			120,039	154,794
1971	80,485	71,877	18,058	20,417	48,355	87,292
1972	32,133	56,382	8,165	10,583	48,775	71,283
1973	6,292	19,821	3,093	5,747	-	-
1974	79,380	105,753	48,890	121,442	-	-
1975	428,393	164,876	229,906	216,938	186,134	185,021
1976	98,538	111,842	94,134	65,173	194,647	160,579
1977	53,850	26,730	21,691	8,449	6,025	20,717
1978	25,231	29,148	10,688	8,084	35,192	64,592
1979	87,611	102,446	85,337	78,178	111,176	194,840
TOTALS:	1,109,268	967,422	519,962	535,011	750,343	939,118
% of Recorded		87%		103%		125%

*** Water Resources Branch - Dauphin Lake Sedimentation Study , September 1982

The estimated bed load which flowed into the lake during the same thirty-one year period, was stated to be 2,240,349 tons (2,032,431 tonnes). It has been assumed that there was no outflow of the bed load, therefore the estimated weight of bed load deposited in the lake was 72,269 tons (65,562 tonnes) per year. In summary, then, the total sediment deposited into the lake during this thirty-one year period was estimated to be 16,966,297 tons (15,391,724 tonnes) or 547,300 tons (496,507 tonnes) per year, or a total volume reduction of 418 acre feet per year. (Table 9) This is equivalent to approximately one foot spread over three quarter sections of land in one year.

The annual sediment yields computed for the major streams flowing into Dauphin Lake are shown in Table 10.

It should be noted however, that the above calculations of sedimentation rate are based on a number of factors which may be possible sources of error, e.g. limited suspended sediment data, and assumptions made regarding:

1) sediment yields from ungauged areas
2) percent of bed load and
3) unit weight used for deposited sediment.

Table 11 provides a comparison of the recorded and computed suspended sediment loads for the Turtle River, Edwards Creek and Vermilion River for the years 1966 to 1979.

6.3 Delta Formation

Following an analysis of river deltas, it was determined by the Water Resources Branch that most of the sediment is widely distributed over the bottom of the southern half of the Dauphin Lake, and a relatively small portion of the entire load is deposited in the deltas. However, it is this silt accumulation at the outlets of the streams flowing into the south end of

Dauphin Lake that is responsible especially for the deterioration of beach areas especially Oaka and Rainbow Beaches. The sediment deposition and delta formation at the mouth of the Edwards Creek Drain has been one of the major concerns for the cottage owners and Dauphin Lake users for many years.

It is apparent from existing studies that if Dauphin Lake is deemed to be a valuable natural resource worthy of preservation for present and future generations, then the problem of siltation must be addressed and positive action taken.

6.4 Remedial Proposals From Previous Studies

To reduce further siltation of the lake, it is of course necessary to reduce the sediment inflow.

In the 1979, Lake Dauphin Siltation Study Program, it was proposed by the Geotechnical section of the Department of Natural Resources that the following remedial measures might be considered to reduce sediment inflow into Dauphin Lake:

(1) Alteration of certain farming practices to reduce sheet erosion;

(2) Construction of gradient control structures and armouring banks and bottom of channels by different means to reduce channel erosion;

(3) Construction of sediment traps or settling basins to reduce sediment inflow from both sheet and channel erosion.

To improve existing beaches, it was proposed that the following steps might be considered:

(1) The vegetation from existing beaches be removed;

(2) that the lakeshore at the beaches be reshaped by dredging with selective placement of fill, i.e. coarse sand to be placed at beaches and fine material offshore;

(3) that river inflows be rediverted into the lake further to the north - e.g. Edwards Creek northward to the Vermilion River, Vermilion River to Wilson River, etc., to protect the most developed southwest shores of Dauphin Lake.

No estimate of the cost of the above program was given. In October, 1981, the Water Resources Branch concluded "that the most practical solution" to the siltation problem at Oaka Beach "is to dredge the channel sufficiently to allow boat access as required."*

A report by the Water Resources Branch respecting the Crooked Creek outlet to Dauphin Lake at Rainbow Beach states that "there is a definite sediment accumulation approximately 3.3 feet (1.01 m) thick and 500 feet (152.4 m) long," and they proposed "that an entrance channel should be dredged through the accumulated deposit to provide access to the lake from the proposed boat launch area."*

It was estimated that the cost of dredging both beach areas would be approximately $29,000.00 to $36,000.00, and that the annual cost of maintenance was estimated at $4,800.00 to $7,200.00.

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*Water Resources Branch, Department of Natural Resources, 1982 Proposal to Raise the Range of Regulation on Dauphin Lake from 853 - 854' to 854 - 855'

6.5 Storage Reservoirs

Dr. R. W. Newbury in his presentation to the Conference on Riding Mountain Watersheds - Joint Responsibilities, at Ste. Rose du Lac, in Manitoba, on March 3, 1983, discussed the evaluation of remedial measures in the Wilson Creek Experimental Watershed. He stated that "headwater reservoirs on top of the escarpment were shown to reduce flood peaks in the uppermost channels of the creek." However, it was pointed out that because stable dams cannot be constructed in shale areas, headwater reservoirs can only control the runoff from the small upper portion of the escarpment. Thus "headwater controls can only partially alleviate the flooding and sedimentation problems."*

The Dauphin Lake Study Proposal of March, 1979, also indicated that headwater storage is ideal on the eastern slopes of the Riding Mountain, as it would aid in delaying the flow and reducing sediment transport, but noted there is a lack of sites suitable for storage of large volumes of water.

Dr. Newbury also stated that "shale bank protection works in the escarpment valleys reduced the amount of shale carried from the escarpment to the top of the alluvial fan, but the major input of shale sediments from fan areas below the escarpment are generally outside the park at the upper end of the drainage maintenance channels."*

The two experimental dams which were constructed three years ago in the canyon section of the Wilson Creek drainage channel cause the formation of temporary ponds which reduce the velocity of the flow which in turn reduces erosion of stream banks. It has been evident that these dams have dramatically reduced erosion of new fan materials and no new land has fallen into the creek in the pond areas. The fans are a major source of sediment as Dr. Newbury notes. "The number of sites along the escarpment which would benefit from erosion control dams has not been determined, but reports of similar land losses due to widening drainage channels below the escarpment by local residents are numerous."*

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*R.W. Newbury, March 3, 1983 - Erosion and Redeposition of Alluvial Fans Due to Stream Base Level Changes Caused by Drainage Channels Below the Manitoba Escarpment

The Lake Dauphin Study Proposal, March, 1979, investigated sub-escarpmental storage on the Henderson, Scott, McKinnon and Wilson Creeks, but found that due to the steep gradients of these streams, the volume would not be significant.

Storage on the lowlands could accommodate large volumes of water, but any significant storage would also flood large areas of cultivated land. The two storage sites which would not flood cultivated land are located on Crawford Creek and in the Beaver Dam Lake - Meezee Lake area. Additional storage sites are also available in the area west of Dauphin. A Committee made up of representatives from Water Resources Branch, Prairie Farm Rehabilitation Administration and the Manitoba Department of Agriculture has been formed for the purpose of conducting a study of headwater storage on the Manitoba escarpment. This study will, in phase 1, "address various aspects of the natural resource base, the hydrologic regime, the benefits and costs of headwater storage generally and will identify areas of the escarpment where headwater storage would be most effective," and "will require eighteen months to complete. Phase 2 will evaluate specific storage sites identified as having the greatest potential."**

* Ibid

**Inter-Departmental Memo, February 6, 1984 - Larry J. Whitney, Water Resources Branch (Manitoba) to Manitoba Water Commission

VII PUBLIC HEARINGS

The Manitoba Water Commission held a public hearing at the Town of Dauphin, in Manitoba, on the 1st and 2nd days of September, 1982, to provide all interested parties with an opportunity to express their views respecting the water level and sedimentation problem of Dauphin Lake.

The following individuals and representatives of organizations presented briefs at the hearings:

September 1, 1982

1. Mr. Art Dyck - Ochre Beach sub-division representative
2. Mr. Douglas Deans - Concerned Citizens to Save Lake Dauphin Committee
3. Mr. Ben Kardoes - Vice-Chairman of Turtle River Watershed Conservation District No. 2
4. Mr. Ernie Ryz - Chairman - Dauphin Beach Committee
5. Mr. Gary Whetter - Acting President of Chamber of Commerce for Dauphin
6. Mr. Joe Robertson - Dauphin Game and Fish Association
7. Mr. Allan Armstrong - Riding Mountain Regional Liaison Committee

September 2, 1982

8. Mr. Dave Snitka - Member of Dauphin Town Council
9. Mr. R. A. Phillips - Reeve of Rural Municipality of Dauphin
10. Mr. Tom Smart - Reeve of Rural Municipality of Ochre River
11. Mr. Gary Cooper - General Manager, Parklands Regional Development Corporation
12. Mr. Jim Mulligan - The Rural Lake Dauphin Flood Committee
13. Mr. Arnold Zihrul - A Local Resident
14. Mr. Gordon McComb - President, Crescent Cove Cottage Owners Association
15. Mrs. W. Welgan - Cottage Owner - Dauphin Beach
16. On December 16, 1982 the Parks Branch of the Department of Natural Resources submitted its brief by mail

SUMMARY OF PUBLIC HEARINGS

The majority of the briefs presented indicated that before raising the level of Dauphin Lake, steps would have to be taken to ensure control of both the outflow and the inflow of waters into the lake.

Some indicated that the Mossy River should be widened and deepened, and that the present dam be extended to increase its capacity. It was also stated that the old Mossy River Dam has not been completely removed and thus impedes the outflow of waters from Dauphin Lake into the Mossy River.

The majority also believed that control of the inflow of waters was a major factor in resolving the Dauphin Lake problems. Some noted that a system of dams, holding or catch basins should be installed on the major streams that flow out of the Riding Mountain National Park into Dauphin Lake.

Others stated that Water Conservation Boards should be formed to deal with the inflow problems. Still others indicated that the problem originated within the boundaries of the Riding Mountain National Park, and that the Federal Government should assume some of the responsibility for the waters that leave the park, which bring with it silt and shale down the escarpment into Dauphin Lake. They deemed it totally unrealistic to attempt to control the water outside of the park boundaries alone.

The Wilson Creek Experimental Watershed Project was referred to as an example of Federal Government participation needed for the Dauphin Lake watershed.

Most of the briefs emphasized that siltation is a major problem that has to be resolved. Several suggested that dredging be carried out to remove the silt from the built up areas. One suggested that the Manitoba Hydro dredge, presently situated at Jenpeg, be utilized at Dauphin Lake.

Several briefs suggested that when the controls of both the outflow and inflow were in place, the water level at Dauphin Lake would then be raised to 856.' a.s.l.

A number of others contended that before the level of the top of the lake is established, steps must be taken to ensure that the bottom of the lake does not continue to rise.

One cottage owner proposed that the maximum level of the lake should not exceed 855.0' a.s.l.

The Dauphin Game and Fish representative stated that the lake level should be maintained at the 855' - 856.5' a.s.l. range.

The Parks Branch of the Department of Natural Resources, in its written submission, presented to the Manitoba Water Commission on the 16th of December, 1982, stated that the low water levels hindered recreational facilities at Rainbow Beach as well as other beaches along the shores of Dauphin Lake, and that it recommended that the level be raised 18 - 24 inches.

Several briefs expressed concern and the need for control structures which would reduce flooding of agricultural and residential lands.

The Rural Lake Dauphin Flood Committee clearly opposed any increase in the lake elevation. It was particularly concerned about the inability of the present system to handle the severe flood problems.

Some of the briefs suggested that the catch basins which would be installed on the streams flowing into Dauphin Lake could be used as fish rearing ponds, as well as provide a control over the duration and extent of the flow of waters into the lake.

It was suggested in several briefs that Edwards Creek should be diverted northward through an existing low lying area which would act as a natural silt trap, and if necesary, the Crown should acquire this land.

It was also recommended that the Crown acquire low lying land which is subject to flooding, and lease it back to farmers on an annual basis.

One of the submissions identified the four problem areas respecting Dauphin Lake as: siltation, water quality, lake levels and the absence of conclusive data. It further stated that there was insufficient data available to enable the Manitoba Water Commission to make solid recommendations respecting Dauphin Lake, and that further studies should be undertaken.

Some briefs indicated that the submissions which were made 15 years ago respecting Dauphin Lake were still applicable today, and that positive action was now necessary rather than more hearings and studies.

All of the submissions stated that corrective measures must be taken to preserve Dauphin Lake so that the potential of this resource can be enjoyed by the various interest groups and residents of the surrounding area, as well as future generations.

VIII STUDY RESULTS AND CONCLUSIONS

There have been many studies dating back to the turn of the century regarding the problem at Dauphin Lake. The studies indicate that a solution lies in expanding the Mossy River outlet to control outflow and, at the same time, building storage sites to control the inflow into Dauphin Lake. Studies also concluded that the cost of both recommendations could not be justified cost/benefit-wise.

The options we face are:

(1) To create a situation where Dauphin Lake will be preserved as a functional lake, or

(2) allow the lake to continue to deteriorate until it is reduced to either a marshy area subjected to frequent flooding or, with effective drainage, useable agricultural land.

The public voice has indicated to the Manitoba Water Commission that the lake should be saved, therefore the public must be aware of the costs that will be incurred to slow down the rate at which the lake is disappearing. The costs of these remedial actions ought to be borne by both the Provincial Government and the Federal Government. Even though the benefits are of direct value to the people of the Dauphin Lake area and the Province of Manitoba, the experience and preservation of the natural environment will benefit all Canadians.

A letter written in 1929 by F. G. Goodspeed, District Engineer to K.M. Cameron, Chief Engineer, Ottawa, indicates that variations in the lake level have been a problem since at least 1902, long before there was extensive agriculture in the region. More recent developments have aggravated the natural range of lake levels and added the problems of soil erosion and siltation of the lake. The Dauphin region experiences very wet and very dry years, with the result that the public response fluctuates between demands for higher lake levels and lower lake levels. Recent reports of increased warming of the earth due to the "greenhouse" effect predict dryer conditions in central North America. Based on these reports it is possible there will be a reduction in the number of wet years and an increase in the number of dry years in the Dauphin area.

It is apparent that Dauphin Lake is representative and symptomatic of many Canadian lakes, but particularly prairie lakes, with their extremes of precipitation and temperature. These sensitivities are aggravated by human activities, and with increasing population and presssure on natural resources, the situation is likely to deteriorate and therefore demands attention.

The Manitoba Water Commission bases its recommendations on the long-term need to conserve the water supply in this province, and contends that long-term social benefits cannot be ignored or compromised for short-term economic benefits.

IX RECOMMENDATIONS

Administrative

1. The Provincial Government should consult with, and attempt to obtain monies from the Federal Government, for a joint Federal/Provincial project to make Dauphin Lake a test study of remedial management for a large drainage basin in a prairie agricultural region. The Federal Government's ownership of the Riding Mountain National Park, the source of many of the rivers flowing into Dauphin Lake, makes it an important partner in resolving the problem.

   Rationale: The problems that have developed on Dauphin Lake are representative of those on most prairie lakes and many other lakes in Canada. The Commission strongly suggests that the time for additional studies and further reports is not available for Dauphin Lake, and that the remedial actions recommended in this report should be monitored as empirical studies to provide information that could be applied to other lakes.

2. The upper control level of Dauphin Lake should be raised to 855.3 feet (260.7 m) a.s.l. and the lower control level should remain at 853 feet (260.0 m) a.s.l.- the minimum draw down level to accommodate spring runoff.

   Rationale: The majority of the briefs presented at the public hearings wanted the lake maintained at a level that would provide the greatest benefit to the greatest number of people. In order to accomplish this, a higher lake level is necessary, however the Commission recognizes that steps to reduce the prolonged effects of flooding must be carried out concurrently.

3. That Conservation Districts be established so that all river systems that drain into Dauphin Lake are included.

Rationale: Conservation Districts have a capacity for local resource management, within the limits of the Conservation District Act. They can serve a very important function making people aware of the entire region, thus providing a context for the resource management of their own area.

4. (i) That the Dauphin Lake Advisory Board, which was created in 1951, be reconstituted by the Minister of Natural Resources with the following membership and new Terms of Reference:

a) Chairman appointed by the Minister of Natural Resources (not a member of his department);
b) One representative from each of the Conservation Districts that fall within the Dauphin Lake drainage basin;
c) One representative from each of the Rural Municipalities of Mossy River, Dauphin, Ochre River, St. Rose du Lac, and the town of Dauphin;
d) One representative from Agriculture Canada;
e) One representative from Water Resources;
f) One representative from the cottage owners;
g) One representative from Provincial wildlife;

h) One representative from Ducks Unlimited;

i) One representative from Provincial Fisheries Branch.

Rationale: It is essential that all citizens of the drainage basin have input to the management of the area. The problems have developed, in some part, because actions in one area have been taken to solve a local problem, but create problems downstream. In addition the Board will serve as a pipeline of information about the activities of the various levels of government.

4. (ii) The new Terms of Reference would require the Board among other things to,

   a) Monitor and advise on activities relating to soil erosion and soil conservation;
   b) Monitor and advise on activities relating to water projects currently in place;
   c) Monitor and advise on any future water projects;
   d) It will be the responsibility of the Water Resources representative on the Board to provide all information about water projects and activities in the Dauphin Lake Drainage Basin;
   e) The Board shall meet twice a year at which time reports shall be given by each of the members about activities that affect the water and soil resources of their area;
   f) The Chairman will submit a written report of the Board's deliberations to the Minister of Natural Resources after each meeting.

Rationale: The previous Board could have served an important function in attempting to make government and people aware of the growing problems. The Board last met in 1961.

5. That a moratorium be placed on the sale of all Crown Lands in the Dauphin Lake drainage basin until it has been established that the land is not required for the implementation of the Commission's recommendations. The Crown should retain ownership of marginal agricultural land which is subjected to flooding.

Rationale: The sale of marginal agricultural land and land which is subject to flooding has created problems. The Commission contends that it is more practical for the government to discourage the development of these marginal lands, and preserve them for a more beneficial natural use, than to pay compensation for crop losses caused by flooding.

6. The Provincial Government should identify the marginal lands subjected to flooding and purchase the land when it becomes available, so that farmers do not continue to farm marginal land.

Rationale: It is less costly, and more logical in the long run, for governments to prevent people from occupying lands that are marginal for agricultural purposes and have a high frequency of flooding. It is unreasonable to expect the taxpayers of the Province to pay compensation to those who choose to occupy land that is subject to frequent natural disasters.

Technical

Control of Water Flow into the Lake

7. Negotiations should be initiated by Manitoba Department of Natural Resources with the Parks Branch of the Federal Government to acknowledge the need for cooperation in resolving the flooding and siltation problems, and to determine their dual responsibilities for solutions thereto. The Wilson Creek experiment should be used as an example for any discussions.

Rationale: Many rivers that flow into Dauphin Lake have their headwaters in Riding Mountain National Park. Although only 25% of the silt in Dauphin Lake originates in the Park many local people believe that it is the only source of the problem. The majority of the sediment originates outside of the park in the alluvial fans and from general surface erosion. The Commission accepts the evidence that the Park activates 25% of the sediment load, but since the headwaters are an integral part of the whole river system, meaningful corrections to the problems necessitates participation of all parties.

8. With respect to storage sites,* it is recommended that:

a) Headwater storage sites on the escarpment be identified and developed;

b) Storage reservoir sites at the foot of the escarpment be identified and developed;

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*cf. p. 54

c) Storage reservoir sites between the foot of the escarpment and Dauphin Lake be identified and developed;

d) All of these storage reservoirs be drawn down in the fall to provide maximum capacity for spring runoff. The amount of draw down can be linked to the use of the reservoir. For example, those reservoirs used for fish rearing should take winter kill into consideration.

Rationale: The construction of drainage ditches and the removal of natural vegetation has led to a dramatic increase in the rate at which runoff reaches the lake. Creation of these reservoirs will slow down the rate of runoff by allowing the water to be retained and then released gradually.

9. All drainage ditches in the Dauphin Lake drainage basin, including those along roadsides, should have weirs constructed at frequent intervals. Class I and II drains should be done last. Higher classification drains should be priorized to identify those that are carrying the largest volumes of water. Small culverts may be placed at the bottom of each weir to allow a constant flow but at a reduced rate. The weirs should be designed so that the water is not retained above the level of the natural water table of the immediate area.

Rationale: The drainage ditches should be considered as elongated retention ponds. A clear distinction must be made between control of the water flow and reduction of siltation. All of these proposals are designed to increase the length of time it takes the runoff to reach the lake. They require that the whole of the drainage basin be included.

Control of Water Flow out of the Lake

10. That portion of the Mossy River identified by the Dauphin Lake Working Group extending from the Terin's Landing control structure to approximately six (6) miles (9.66 km) downstream should be dredged.

Rationale: It is important to reduce flood peaks down to the new control level as quickly as possible. The portion to be dredged is only that section of the Mossy River that impedes drainage.

Control of Siltation

11. An educational program emphasizing methods of controlling sheet and channel erosion should be carried out for the benefit of all farmers in the Dauphin Lake drainage basin.

Rationale: Riverbanks left in native vegetation, or seeded to grasses or legumes, will inhibit soil erosion and resultant siltation.

12. Rock weirs should be constructed in rivers and streams that drain from the escarpment with priority being given to those that are eroding their alluvial fans. The work should be done in the manner established in the Wilson Creek experiment or similar thereto.

    Rationale: Extension of drainage ditches back into the alluvial fans at the foot of the escarpment, has changed the profile of the streams and rivers resulting in erosion of the fan material. The weirs would slow down the flow thus reducing its erosive power.

13. The channel dredged by cottage owners to provide boat access denied by accumulation of silt known as Edwards Creek delta, should be deepened and maintained by the Provincial Government.

    Rationale: This delta has developed as a direct result of the construction of the Edwards Creek drain and has blocked access that was previously available.

14. The Turtle Marsh should be developed as a wildlife area. The raising of Dauphin Lake will flood a portion of this area thus making it an improved wildlife habitat. Funding from such groups as Ducks Unlimited should be sought and, if forthcoming, dikes and control structures could also be built to maintain the 855.3 foot (260.7 m) a.s.l. level independent of Dauphin Lake.

Rationale: This marsh is large and has a high potential as a wildlife area. Approximately 50 per cent of the area is already Crown Land; the remainder has low classification for agriculture. The marsh area also serves as a silt trap thus reducing the sediment entering the lake.

Suggested Order of Precedence

Because the problems of Dauphin Lake cross geographic, political and social boundaries, and come under the jurisdiction of various Government departments at all levels, the Dauphin Lake Advisory Board should make every effort to communicate with and have as many groups as possible participate in the solutions of these problems.

The specific order for commencement of these proposals should be determined by the Minister of Natural Resources for the Province of Manitoba, however, the Commission suggests that the general order be as follows:

1. A meeting with the Federal Government to discuss a joint project, and confirmation of Federal Government participation and funding outlined in recommendation #1;
2. Appointment of the Dauphin Lake Advisory Board;
3. Commencement of an education program of the overall problems of runoff control, soil erosion and sedimentation particularly in the farming community;
4. Dredging of the Mossy River;

5. Construction of weirs in the drainage ditches and the alluvial fans;
6. Raising of the upper control level of the lake to 855.3 feet (260.7 m) a.s.l.;
7. Construction of the headwater storage reservoirs;
8. Construction of the remaining storage reservoirs.

Rationale: The costs of these recommendations are very high, and since both federal and provincial government lands are involved, the implementation of these recommendations will require joint funding by both levels of Governments. Also, the expenditures should be spread out over several years. The problems took time to develop and the remedial action will likewise take time to complete. The proposed sequence is designed to preserve the lake with as little side effect as possible.

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Dauphin Lake

Proposed Terms of Reference to the Manitoba Water Commission

August, 1982

In 1973, the Manitoba Water Commission completed a report on Dauphin Lake Regulation. No change in the target elevation of 854.3 was recommended at that time mainly because of inadequate data. The Commission did recommend, however, that

> "when the results of ... additional studies ... have been obtained, this currently recommended level of regulation should be reviewed".

The two major groups involved in this matter are the Lake Dauphin Flood Committee and the Concerned Citizens to Save Dauphin Lake. It is apparent from recent correspondence from these two groups that they have been unable to agree on a mutually satisfactory range of regulation. Both groups support modifications to the Mossey River channel and outlet structure in order to obtain more effective control over Dauphin Lake levels. Both groups have also indicated that the reduction and removal of silt transported into Dauphin Lake is necessary. However, conflict over the optimum range of regulation of Dauphin Lake continues with agricultural interests desiring that levels not exceed elevation 854.3 and recreational interests indicating a preference for elevation 856.0. Optimum levels for wildlife and fisheries must also be considered. Until this conflict is resolved the acquisition of land and/or the construction of works needed for the effective control of Dauphin Lake and related improvements cannot proceed.

Since 1973 a number of minor studies have been undertaken which may be of assistance in determining the optimum range of regulation for Dauphin Lake. These studies include: "Dauphin Lake Study Proposal" March, 1979; one foot contour map of the south and west shorelines of

Dauphin Lake, March, 1981; "Proposal to Raise the Range of Regulation on Dauphin Lake from 853-854 to 854-855" October, 1981; and the Dauphin Lake Sedimentation Study which is nearing completion.

In view of the above circumstances and others which may subsequently be identified by the Manitoba Water Commission, I hereby direct the Commission as follows:

1. The Commission, having regard to the needs of the various interests which are or may be affected by the levels of Dauphin Lake now and in the foreseeable future, will determine and recommend to me an acceptable range of regulation for Dauphin Lake. The Commission will also determine and recommend what, if any, measures should be taken with regard to problems related to siltation in Dauphin Lake.
2. The Department will make background information available to the Commission as well as undertake the necessary field surveys and technical investigations which the Commission may require during the course of its study.
3. The Commission will consult with various government and private agencies as well as convene public hearings as it deems necessary to enable local organizations to present their positions.
4. The Commission will render a final report to me as soon as it is practicable to do so.

Al Mackling.

APPENDIX II

KEY QUOTES FROM SUBMISSIONS PRESENTED AT PUBLIC HEARINGS

1. Mr. Art Dyck

- A Representative of the Ochre River Sub-division
(consisting of approximately 24 cottage owners)

"We the residents of Ochre Beach, on the south-western rim of Lake Dauphin, believe that this controversial lake has the potential of once more becoming a commercial and recreational resource for this Parkland region".

"To save Lake Dauphin, we endorse the following steps, as have been set out by the Concerned Citizens group...

"The Mossy River Channel and control structures must be improved so that the lake level can be effectively managed by the local Water Control Staff ...

"A system of holding and/or sedimentary catch basins must be put into place on the major tributaries that contribute the majority of silt to Lake Dauphin. This will not only affect the water quality, but also the silt inflow . ...

"Once the inflow and outflow problems are corrected, a program of silt removal will be necessary in built up areas. The final step of these is the lake level. Once these steps have been taken, we feel that the lake level should be raised to 856' a.s.l. ...

"...Edwards Creek drain is by far the greatest contributor to siltation of the water in our lake...

"We propose slowing the Edwards Creek drain down through added silt traps, creating a program of maintaining the traps on an annual basis, diverting

the mouth of Edwards Creek north of its present exit into a large marsh, which could act as an excellent sediment settling basin, and using the removed silt from these catch basins through landfill use or in other low lying areas."

"We have a natural resource in the heart of a vacationer's paradise, thriving business, an agricultural community. If siltation and water flow are controlled, this resource can co-exist with our other commercial enterprises, and thus benefit a greater population. The dollars spent now will ultimately return to the community and give our future generations a pride and satisfaction to say that their forefathers had the courage, the technology, to save Dauphin Lake for future posterity."

2. Mr. Douglas Deans

- Concerned Citizens to Save Lake Dauphin Committee

"This Committee is composed of members of elected executives of five local beach committees, the Dauphin Game and Fish Association, the Dauphin Golf and Country Club, plus several local concerned citizens. ...

"Dauphin Lake is a beautiful natural resource that covers an area of approximately 125,000 acres. It has served as a major source of recreation and personal income for the 20,000 plus citizens from all walks of life of the immediate surrounding area... Unfortunately, over time the quality of the lake has deteriorated, until now we are at a point where positive and corrective action must be taken to save Dauphin Lake. ...

"Our Committee believes strongly that any solution to Dauphin Lake requires improvement to the Mossy River Control Structure and improvements to the channel of the Mossy River itself. ...

"The Lake level desired for Dauphin Lake by the Concerned Citizens to Save Dauphin Lake is 856 feet above sea level on July 1st annually. This desired level is to be maintained as close as possible to this level throughout the months of July and August. Assumed in this request is that a suitable control structure and necessary down stream improvement to the Mossy River will be in place that will allow Dauphin Lake to be properly regulated and managed. ...

"...a system of holding and/or sedimentary catch basins must be in place on the major tributaries that contribute to the majority of silt in Lake Dauphin. This will not only affect water quality but also affect inflow. The Watershed Boards must play a major role in this step. ...

"The Committee believes that the quality of the inflow is a major factor in the long term restoration of Dauphin Lake and that the best place for its resolution rests within Water Conservation Boards. ...once the inflow and outflow problems are corrected, a program of silt removal will be necessary in built up areas. ...

"One very positive suggestion that came out of one of our meetings with the Turtle River Watershed Board (Ochre River Sub-district) was to divert the Edwards Creek drain northward through an existing low lying area that would act as a natural silt trap. ...

"We, the Committee, realize that it will take time and lots of dollars to save Dauphin Lake, but the economic and social benefits to be derived both for the present generation and for future generations, is well worth the cost and effort. We, the Committee, strongly suggest that the first step and the most important of many steps necessary to restore Dauphin

Lake to its rightful place in our community is to construct facilities so that Dauphin Lake can be properly managed and regulated. Once this is in place, regulate the lake at 856.0' a.s.l. for the months of July and August for the maximum benefit for all the 20,000 citizens of the surrounding area."

3. Mr. Ben Kardoes

- Vice Chairman of the Turtle River Watershed Conservation District No. 2

"The Turtle River Watershed Conservation District consists of all the lands within the Rural Municipality of McCreary, Ste. Rose, Ochre River, parts of the Rural Municipalities of Rosedale, Lawrence and Dauphin, as well as a small part of the Local Government District of Alonsa. The towns of McCreary, and Ste. Rose du Lac are included in this area, as well as the unincorporated districts of Ochre River, Makinak, Laurier and St. Emilie. Two hundred and forty-one sections of land situated in the Riding Mountain National Park are also within the Conservation District boundaries. ...

"As a Conservation District we are concerned with the conservation of all resources. Lake Dauphin is no exception. It is one of the most valuable resources in the parkland region. ...

"There are 241 sections of land, that's 241 square miles, within the confines of the Riding Mountain National Park, and they are within our Conservation District boundaries, but we have no power or no control whatsoever in this large area. ... After a heavy rain, we are finding nature in the form of shale, silt and debris leaving the confines of the park at breakneck speeds and with such force it demolishes bridges and whatever else is in the way on its hurried journey to Lake Dauphin. I am convinced that the major contributor of silt and shale being deposited in Lake Dauphin is the Riding Mountain National Park. ...

"Another concern of major proportions is the control of water to reduce flooding of both agricultural and residential lands along the various water courses. ...

"If we can convince Governments to control the flow of water out of the Park, and we are provided with sufficient funding to properly construct the waterways to Lake Dauphin, we are fully confident that clean water will be entering the lake. ... To achieve a satisfactory drainage program for the entire district, including Lake Dauphin, it is unrealistic to start at the Park boundary. The alternative which we have been advocating and which we consider feasible, is to control the water leaving the park. ...

"We believe that before the level at the top of the lake is established, we must be assured that the level at the bottom of the lake is not raised. ...

"I am convinced that, even during these difficult economic times, we have a responsibility to our future generations."

"...after man came and cultivated the land between mountain and lake, the natural filter, which previously filtered the water escaping the park, now does not exist. Therefore, the water will leave the confines of the Park and enter Lake Dauphin in a matter of hours, carrying with it all the silt and debris it has brought out of the park."

"...now we see our streams flooded and then nearly dry over a matter of weeks. If we could control that water coming out of the Park, those streams would be regulated more evenly. It would provide much better fish spawning. All wildlife would benefit from it, within the park, outside the park, within

Lake Dauphin, and the agricultural base would benefit. It could provide irrigation. ...there are numerous benefits which can be provided, but we need participation and co-operation of Parks Canada."

With reference to the Wilson Creek Experimental Project, Mr. Kardoes stated:

"But what they did at that time was control the water from the higher escarpments with a series of dams and holding basins all the way down in different levels, and letting it out under control. We feel, that this type of system...if it could be done on all the other major streams coming out of that Park, where most of the water is coming from, then we have a large part of our problem solved, and it would also solve the problem of the increase and decrease of the lake because you would be controlling the water going in."

4. Mr. Ernie Ryz

- Chairman, Dauphin Beach Committee

"The Dauphin Beach Committee is a group of citizens that represents all cottage and landowners at Dauphin Beach. The area involved is 92 lots on Plan 2632 and 40 lots on Plan 198 in the Rural Municipality of Ochre River... The lake level has been a concern of this Committee and the people we represent for many years. ...

"...our Committee concurs with the Concerned Citizens to Save Lake Dauphin brief as presented in its entirety."

"I'm going by the majority of the people that I get information from, and we took quite a good look around, and we believe that 856' is the level."

5. Mr. Gary Whetter

- Acting President of the Chamber of Commerce for Dauphin

"The Dauphin Chamber of Commerce, which represents more than 200 business firms and individuals, strongly supports any effort to restore and rehabilitate Lake Dauphin. ...

"The Chamber of Commerce would therefore urge the Manitoba Water Commission to move as quickly as possible with programs geared to restoring Lake Dauphin to its full potential. In order to reiterate the concerns of the Dauphin business community, a copy of the Chamber of Commerce submission made in October, 1968, to your Commission is attached...Conditions after another fifteen year interval are such as to point up the growing urgency for action before it is too late."

(1968 Brief - quotes)

"The Dauphin Chamber has been concerned for some years that no satisfactory solution has been determined regarding the control and maintenance of the level of Lake Dauphin. We feel that the time has come when a level which was acceptable to the largest number of people in this area is not only established, but effectively maintained. ...

"The Chamber is of the opinion that the considerable investment of the 175 cottage owners at the five beaches around Lake Dauphin must receive consideration by the Board. ...

"The Dauphin Chamber of Commerce recognizes that silting is a secondary problem of water control in Dauphin. ...

"The Dauphin Chamber of Commerce is of the opinion that if Lake Dauphin is to be preserved to meet the requirements of our agricultural area, our recreation and tourism requirements, and preserve fishing and wildlife, that active consideration should be given to the following proposals:

1. Dredging and diking where required to protect properties in order to maintain the lake at a new increased level. Where diking is not considered practical, all marginal property should revert to or remain in the name of the Crown.
2. A more accurate and reasonable control of the dam facilities in the Mossy River to maintain more constant lake levels.
3. A complete review of drainage practices and policies of all municipal authorities within the Dauphin Lake drainage area, the object being to effectively control the silt build up in the lake."

When asked to express his opinion on the 856' level suggested, Mr. Whetter replied:

"I tend to agree with Mr. Kardoes, that it's not so much the level of the lake in the top as it is in the bottom. If you can get the silt out of there, through preventative maintenance, or measures, you might begin to solve the problem, and raising it or lowering it is really secondary at this point."

6. Mr. Joe Robertson

- Dauphin Game & Fish Association

" I represent the Dauphin Association of the Manitoba Wildlife Federation, better known locally as the Dauphin Game & Fish. We have 260 paid up members."

"The material presented in this brief...is presented to support the contention of the Dauphin Association of the Manitoba Wildlife Federation that the present water levels of Lake Dauphin at 853 to 854.3 feet is not in the best interest of all persons or communities using the lake recreationally or commercially. ...

"We are convinced one of the major deterrents to the fish and waterfowl production is the draining of the marsh areas brought about by the present low level maintained on the lake. ...

"We believe Lake Dauphin natural resources has an annual potential of one million dollars and to realize that potential the lake level must be maintained at 855 to 856.5 feet. At this level the marsh areas of the lake can be restored to its potential productive capabilities.

"The control dam on the Mossy River is a major factor in the management of Lake Dauphin. ...

"The Dauphin Association of the Manitoba Wildlife Federation would be extremely alarmed if changes were made to the dam that would increase the more rapid draw down of the lake before there was agreement to maintain the lake at 855 to 856.5 foot level. ...

"We are convinced that Lake Dauphin is an important resource - an important reservoir in the watershed of this region and this function must be preserved."

7. Mr. Allan Armstrong

- Riding Mountain Regional Liaison Committee

"Our Committee represents eighteen municipalities around Riding

Mountain National Park, which have joined together for the purpose of resolving some of the negative economic impacts caused by the Riding Mountain National Park which affect surrounding municipal and private landowners outside its boundaries. ... Our Committee is a sub-committee of the Parkland Regional Development Corporation. ...

"In the opinion of the Riding Mountain Regional Liaison Committee, the large drainage areas impacting on Lake Dauphin where waterways originate in Riding Mountain Park must be studied from the head end of each stream to the lake itself. ...

"The Riding Mountain Park must be held responsible for the management of these streams within its boundaries as they affect Lake Dauphin and the rest of the watershed. It is our opinion that realistic measures cannot be taken without the Park being part of the remedial program. Accordingly a resolution was passed at our August 26 meeting which reads:

'Whereas Lake Dauphin and Municipalities adjacent to Riding Mountain National Park are affected adversely by siltation, flooding, and erosion by waterways originating in the Park;

And whereas Parks Canada policy is committed to taking responsibility for its impact on neighboring jurisdictions;

Therefore be it resolved that Parks Canada enter into a research program with the surrounding jurisdictions to alleviate these problems' ....

"While our resolution suggests that Parks Canada has a primary responsibility since the streams originate in the Park, we are of the opinion that the Government of Manitoba must also take the initiative in seeking the involvement of the Federal Government in the process of defining the problems and their solutions. ...

I wish to conclude my remarks by urging the Manitoba Goverment, through your Commission, to actively seek participation of Parks Canada and the Federal Government in the Lake Dauphin situation."

8. Mr. Dave Snitka

- Member of the Dauphin Town Council

"...the papers that I have with me are basically viewpoints of the Town of Dauphin. They date back to 1968 and the Town decided, rather than make up a new brief, that the things that have been said by the Town in the past still is what the Town believes in. The figures may have changed because of inflation, but the problem is basically the same and I think we feel that the problem hopefully will be dealt with by this Commission. ...

"...it isn't a matter of just raising or lowering or whatever; I think a lot of the problem is with the silting of the lake, and if...something could be done - silt traps, etc., possibly this could be helped." ...

(The Town Council passed the following resolution dated May 21, 1981)

"That we hereby support the recommendations made by the "Citizens to Save Lake Dauphin" and hereby approve of the Mayor and Secretary Treasurer to sign the letter of support on behalf of the Town of Dauphin."

9. Mr. R. A. Phillips

- Reeve, Rural Municipality of Dauphin

"We feel that before any consideration can be given to raising the level of the lake, the Mossy River outflow must be improved, so as to be able to remove excess water at a rate that would limit flooding of farm land. Also a system of dikes along the lakeshore and riverbanks would have to be constructed to protect as much land as possible. The lower lying land should be purchased and held by the Province. It could be leased back to farmers on an annual basis re: production. ...

"To help correct the silting of the lake, a system of holding basins should be constructed along the foot of the Riding and Duck Mountains to regulate the flow of water in flood conditions. ...

"The major problem with the flooding and siltation comes out of our parks. It is added to by the farmer and the cultivation of land, but basically it's the great gush of water as it comes down off the escarpment of our mountain, and then this carries, of course, everything with it into the lake. ...

"Also sedimentary catch basins must be put in place in the marsh areas of Lake Dauphin at the mouths of our rivers as they enter the lake. Riverbanks should be purchased by the Province or Federal Government where erosion is a problem and corrections made, and leased back to the farmer. ...

"As to the holding basins along the edge of Riding Mountain National Park, we feel that the Federal Government must be involved in the use of parkland and the financing of these basins."

"...if any change is made to the lake level, agriculture must be protected as a first priority, and if unable to be protected, must be financially compensated for any erosion in the productivity of any farmland."

10. Mr. Tom Smart

- Reeve, Rural Municipality of Ochre River

"...our Municipality is also a member Municipality of the Turtle River Conservation District, and as such, we take a somewhat different view of practices along the Riding Mountain than possibly some of the other Municipalities bordering the Park. ...

"...the whole problem, ... is emanating from the Riding Mountain National Park. ...In order to solve our problem, we have to start at the top of the escarpment. ...

"...the first point that we should aim for...is to control silt, debris, trees, etc., coming out of the park; and they've got to be controlled within the Park, not at the Park boundary or down near Lake Dauphin.

"Secondly, we should strive to get the Federal Government to accept full responsibility for that water as it leaves the Park. ...

"And so far as the beach owners feeling that they should raise the lake level two feet or a foot and a half, or whatever they have in mind, that is a mistake, because, ladies and gentlemen, you are not solving the problem. ... The first thing we have to look at is to control the water coming out of the Park. ...

"You can't solve the problem in one year...but you should set out priorities in order, in proper sequence, so that first of all, we're going to tackle the Riding Mountains to shut the water, the flow of debris and silt coming down from the Park.

"Then the next problem would likely be to clean some of the silt areas out around the beaches. And one thing I would recommend...is that the mouth of the Edwards Creek, the land to the north of it should be purchased, and that the mouth of that creek should be diverted to the north, to spill some of this silt out into the marshland, rather than keep adding more silt to the lake. ...

"...the main thrust to save Lake Dauphin must be the total cooperation between beach committees and the Rural Municipalities involved in the Turtle River Conservation District and the Town of Dauphin, because that is the route to go."

11. Mr. Gary Cooper

- General Manager, Parklands Regional Development Corporation

" As a municipally based organization, the Parkland Regional Development Corporation was requested by the Turtle River Watershed Conservation District to form a Committee to examine the issues regarding Lake Dauphin and to develop a strategy for dealing with them. ...

"One of the main problems we encountered in trying to assess the degree of annual siltation on Lake Dauphin was a lack of definitive data. ... It is apparent that more definitive research is required before working solutions can be developed. ...

"We are pleased to support the recommendations of the Riding Mountain Regional Liaison Committee, as a separate Committee of our organization dealing with the impact of Riding Mountain National Park on surrounding municipalities and private landowners. ...

"Our recommendation to the Commission is to urge the Government to proceed with the necessary technical research in order to define the problems. The Federal Government and Riding Mountain National Park should be asked to participate in the process. A practical program for alleviating the pressures on Lake Dauphin should be developed and through dialogue with local people and the involvement of the three levels of Government in the process, an action plan can evolve."

Dr. T. Ball, a member of the Water Commission directed the following question to Mr. Cooper:

"...do you think there is now enough data available for the Commission to make solid recommendations as to what should be done, or do we need to collect more data"?

Mr. Cooper's reply: "Are you asking me if I believe that enough technical information exists"?

Dr. Ball: "Yes"

Mr. Cooper: "No, I definitely do not think so. I think that the 1979 report and its recommendations make it quite clear that there is more technical information needed.

"We have a real problem in this area with water drainage, and I don't believe that the Provincial Government or the Federal Government, are making enough financial commitment to this area in addressing those problems."

"...I think the crying need is for some tangible, concrete action by the Government in dealing with the problem. It's not going to go away."

12. Mr. Jim Mulligan

- Rural Lake Dauphin Flood Committee

(represents approximately 70 farmers)

"The Rural Lake Dauphin Flood Committee is deeply concerned with these submissions that urge the Government of Manitoba to regulate the waters of Lake Dauphin at abnormally high levels. Experience has taught the farmers that lake elevations in excess of 260.4 m above sea level have always presented a costly menace to the livestock economy of the Lake Dauphin area. ...

"Some misinformed critics persist with declarations that the native forages from lake meadows are unsuited even for bedding purposes. ...producers have experienced excellent success through the years in livestock on native lake meadow forages. Let us not be lulled into a false understanding that high lake levels will affect the agricultural economy only to the extent that they destroy native pasture and hay lands in the vicinity of the lake. Lake elevations in excess of 260.4 m tend to restrict access to acreages of cultivated lands.

"Higher water tables as a consequence of elevated lake levels are certain to aggravate the salinity problem associated with considerable acreages of cultivated "alkali" soils in the region. ...

"As we made it very clear, we are opposed to any increase in Lake elevation, we are not opposed to any deepening of Lake Dauphin. We have investigated the availability of a dredge and have located one at Jenpeg. This dredge is in fully operable condition and is sitting idle at present. ...

"We can foresee no problem in getting rid of any silt as islands could be formed or shorelines built up. ...We feel that dredging certain areas, such as outlets of rivers, for example, Mossy River, beach fronts and other necessary areas, will provide a long term solution satisfying everyone concerned."

"Our proposals:

(1) That the Mossy River be widened and deepened to maintain a mean level of Lake Dauphin.

(2) Some suitable method employed to slow down water and silt on all tributaries.

(3) Dredging as necessary." ...

13. Mr. Arnold Zihrul

- A Local Resident

"I also hereby request this Water Commission to procure copies of three previous Water Commission hearings on the Dauphin Lake, namely November 1968, February 1973, February 1976; and nothing has really changed since the present range for control of 260.0 to 260.4 metres was set up by the Lake Dauphin Advisory Board in 1951. ...

"The Manitoba Government must also be prepared to pay compensation to land owners when flooding occurs, as the higher lake level will reach lands not subject to previous flooding during times of high precipitation."

"Until such time as the Manitoba Government is prepared to make the improvements on the Mossy River channel and dam as outlined by the Water Resources Engineers to the Minister of Natural Resources, after physical survey of the area during 1972 and '73, to bring the outflow of the Dauphin Lake in line with the inflow during times of high precipitation, I hereby request the Manitoba Water Commission to recommend a 20-year freeze on the present range for regulation of 260.0 to 260.4 metres of Dauphin Lake to the Minister of Natural Resources."

14. **Mr. Gordon McComb**

- President of the Crescent Cove Cottage Owners Association

"I would like to...address the terms of reference...of your Commission."

"One thing I've noticed through the hearings, and it's a concern of mine, and I call it pollution. ...you can see certain feed lots, for example, in the winter time. They feed their cattle on the ice and there is a certain amount of pollution. ...

"In other places...you see where people are using the side of a bank either for derelict cars, old machinery, you know, and sometimes it's personal garbage that is being dropped in. ...

"And you also have the chemicals, a chemical container sometimes, and you see them coming down the streams in the spring, with the spring rush and a lot of the times it ends up floating around and on the lakeshore and on the beaches. I'm just wondering if the terms of reference could consider or be expanded to consider this aspect, the pollution actually entering into the lake and affecting the quality."

15. **Mrs. W. Welgan**

- Cottage Owner - Dauphin Beach

"I have heard it stated so often this is a dead lake. They say it is polluted. It is neither. The lake water is in good condition as far as nutrients go. But for the future the Environmental Branch should start looking to having septic tanks and fields compulsory for cottage owners. ...

"Concerning the mud and silt in the lake, I agree with the former brief, saying the waterways leading in and out have to be dealt with at the Riding Mountain, Duck Mountain, also the waterways themselves. I also agree somehow the silt has to be removed from the bottom of the lake by dredging and by the Mossy River dam. The part I do not agree with is the proposed level of 856'. ...Having had a cottage at Dauphin Beach since 1945, I have seen four floods. ...I propose the lake be held no higher than 855.0'. For if we have a flood again it would be disastrous as Mossy River wide open couldn't handle it. ...

"The silt is the problem which needs to be solved."

16. Parks Branch

- Department of Natural Resources submitted a brief to the Manitoba Water Commission, December 16, 1982.

"Parks Branch operates two Provincial Recreation Parks, Rainbow Beach and Methley Beach, on Lake Dauphin."

"Rainbow Beach is the major provincial recreational facility on Lake Dauphin. The existing park plan consists of a 36 unit campground, day-use area, washrooms/change house, concession and beach. Capital development is currently underway on a new 80-unit campground, group use area and boat launch. ...The substantial capital investment for park infrastructure at Rainbow Beach will benefit visitors from local, regional and provincial markets.

"Methley Beach, located northeast of Rainbow Beach, is a smaller facility which is used primarily by local residents. ...

"The two Provincial Recreation Parks account for a significant amount of recreational use on Lake Dauphin." ...

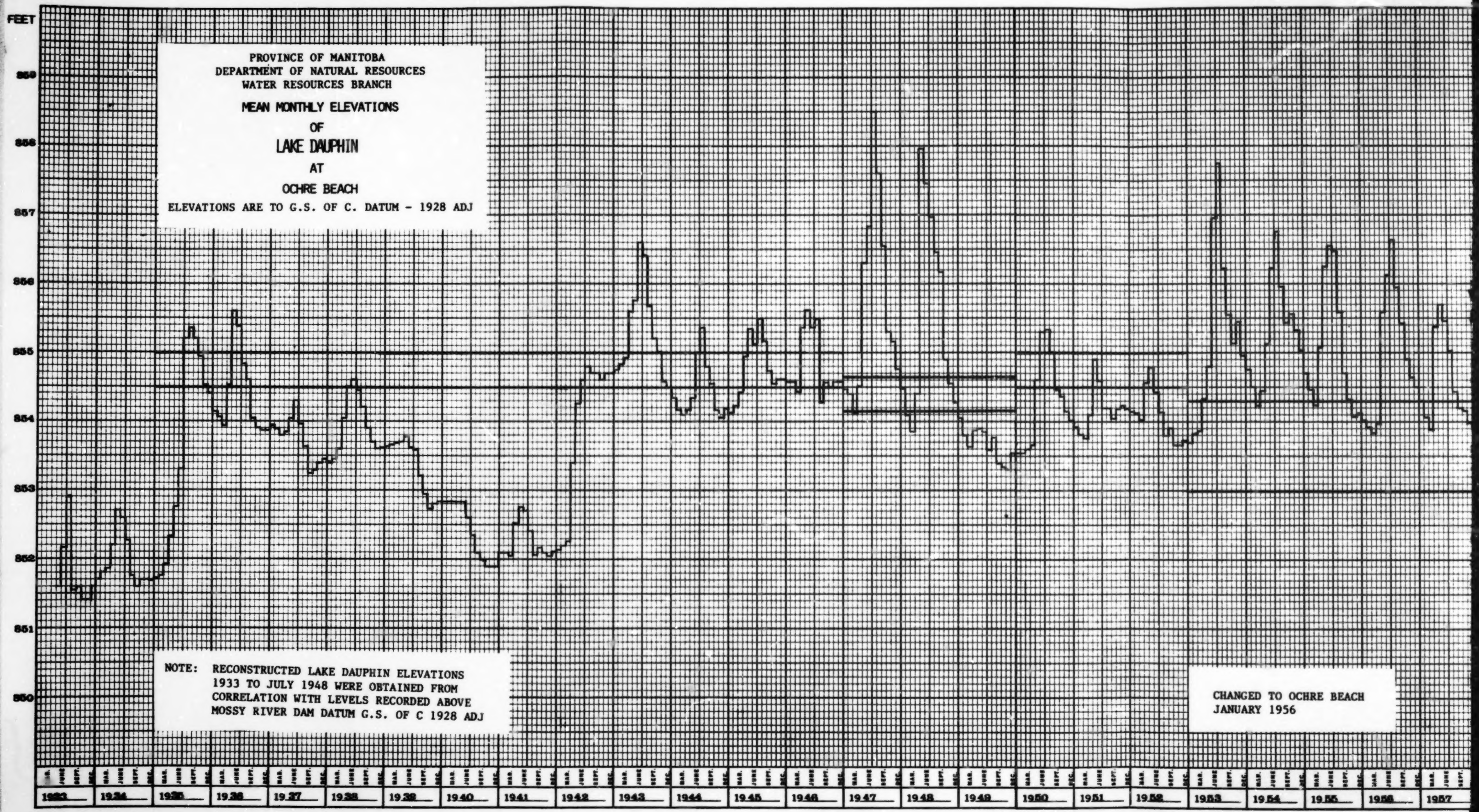
"A 1981 survey of visitors to Rainbow Beach revealed that 30 percent rated the condition of the beach unsatisfactory...visitors were unhappy with the low water level, amount of exposed mud and weeds, concentration of algae and lack of sand."

"Parks Branch favors an increase in water level for Lake Dauphin. The low water levels have created aesthetic and maintenance problems to the beach areas at Rainbow Beach and Methley Beach. ...

"Low water levels on Lake Dauphin have also hindered recreational boating...

"Sport fishing quality and algae concentrations are also affected by low water levels. ...

"Parks Branch favors a sustained water level increase on Lake Dauphin. Parks Branch recommends the water level on Lake Dauphin be raised 18 - 24 inches to improve general site and boating conditions."



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AT
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NOTE: RECONSTRUCTED LAKE DAUPHIN ELEVATIONS 1933 TO JULY 1948 WERE OBTAINED FROM CORRELATION WITH LEVELS RECORDED ABOVE MOSSY RIVER DAM DATUM G.S. OF C 1928 ADJ

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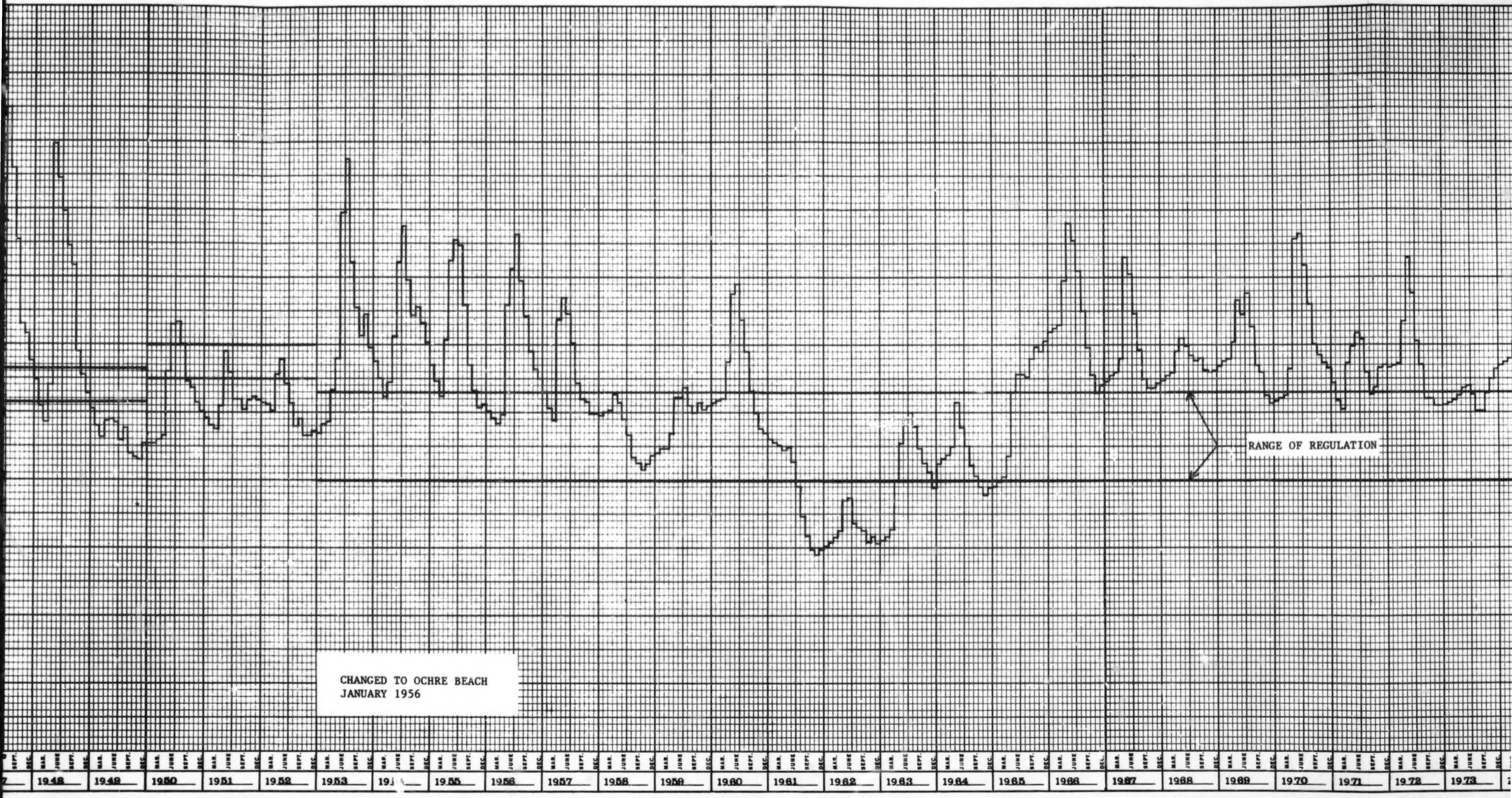
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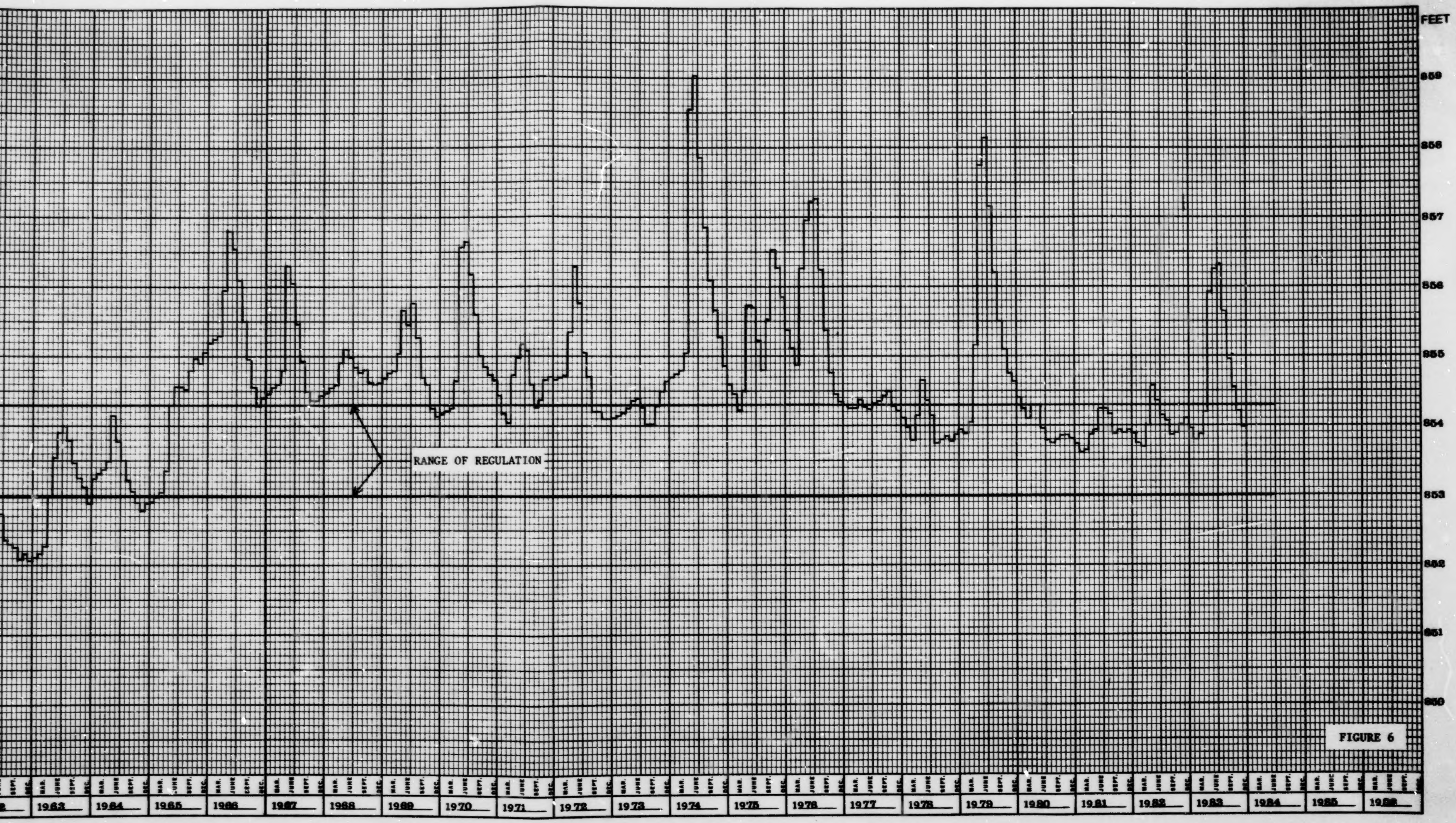
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FIGURE 6